THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

Etc.

VOL. XCII.

OCTOBER TO DECEMBER, 1905.

LONDON:

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

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THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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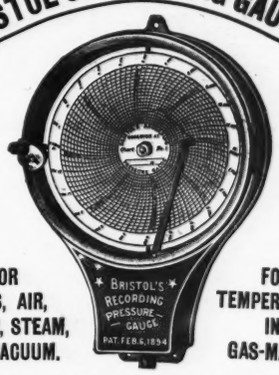

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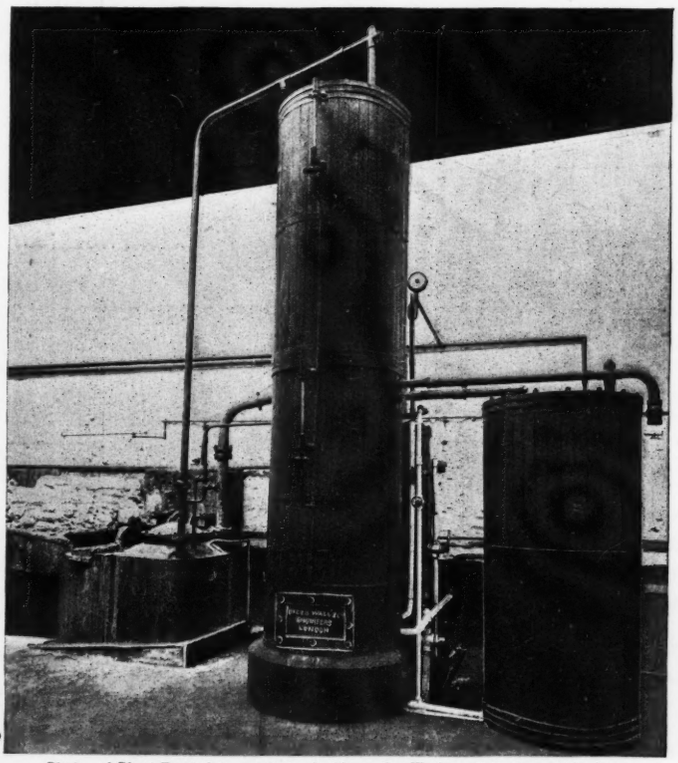

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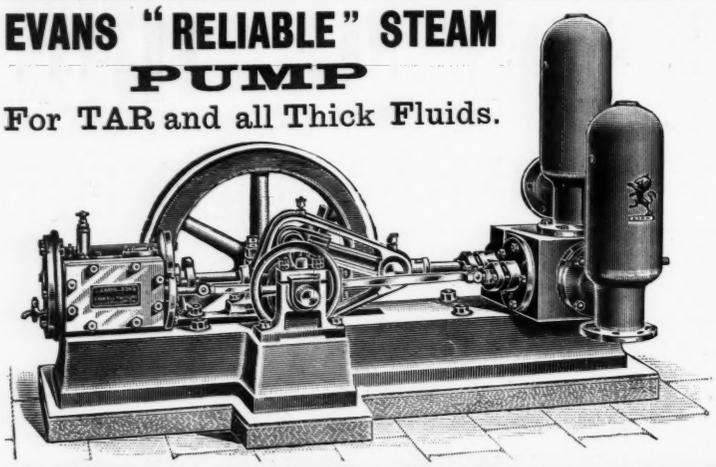

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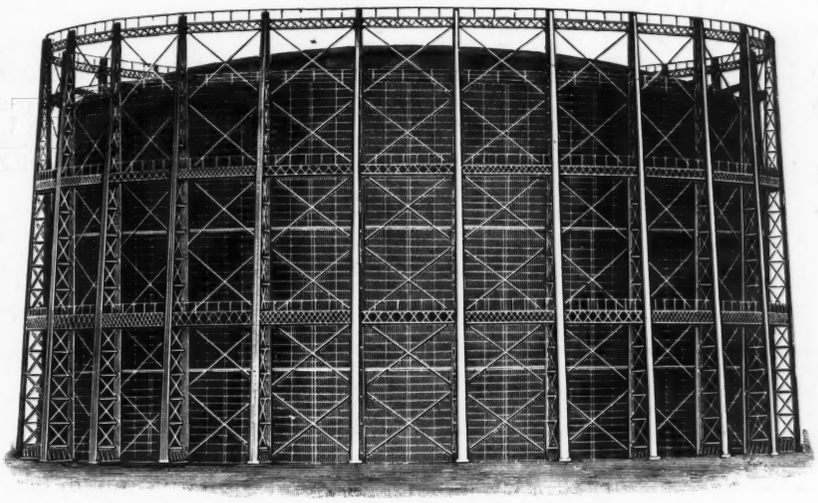

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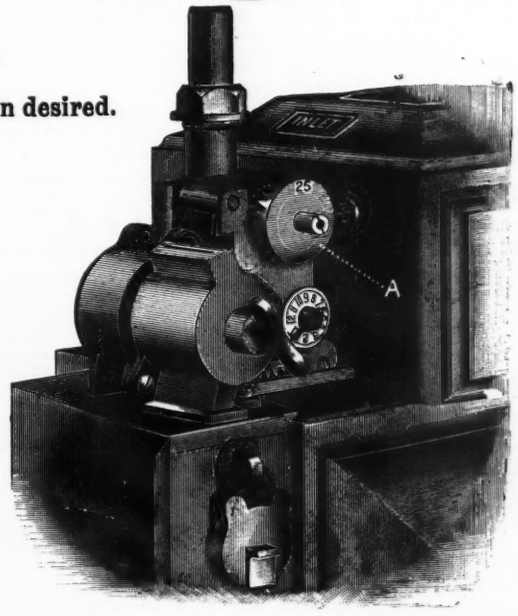

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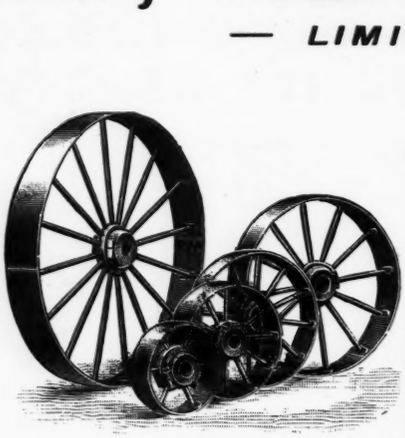

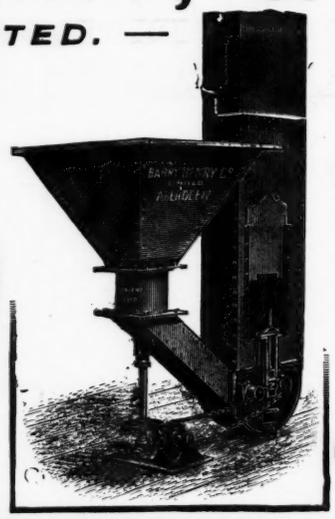

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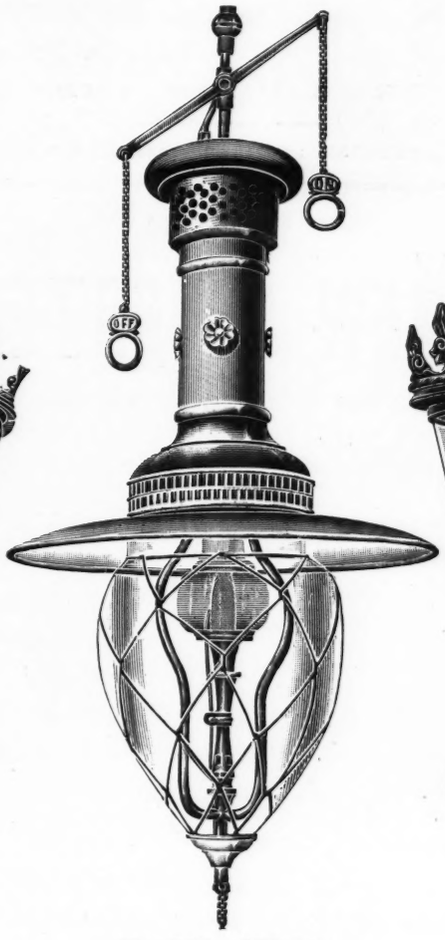

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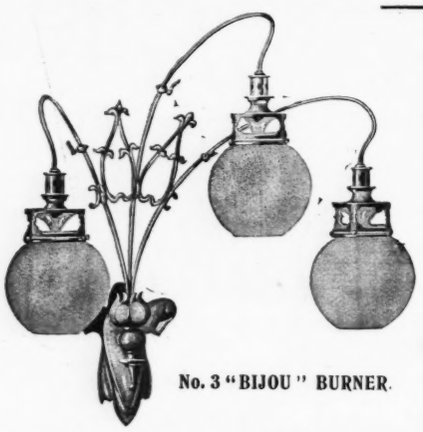

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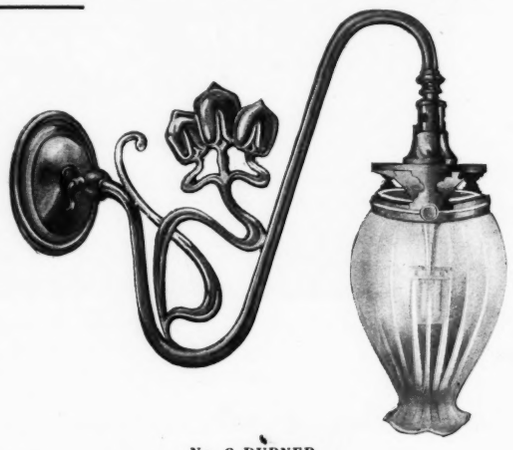

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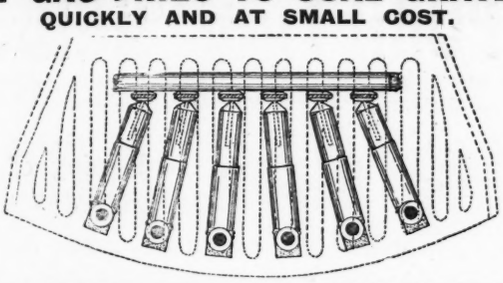

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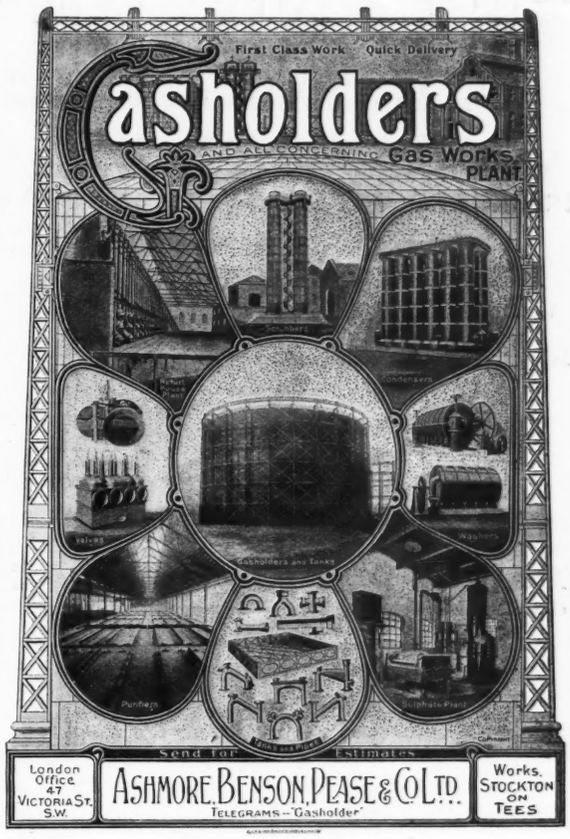
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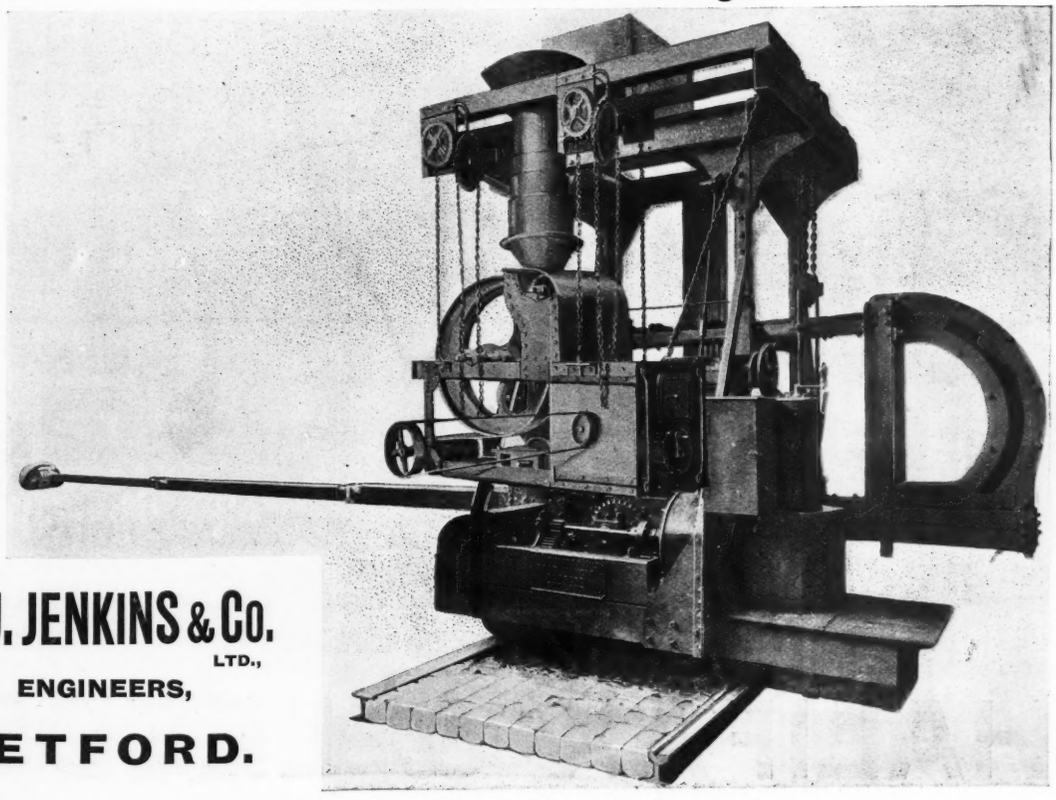

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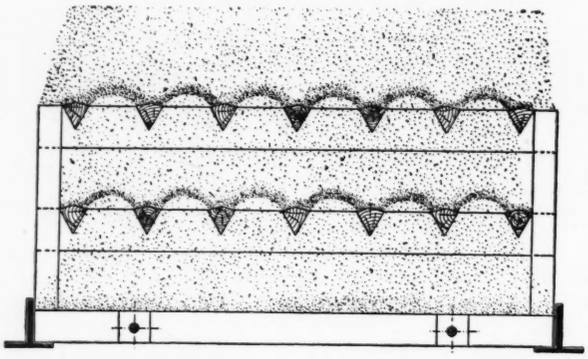

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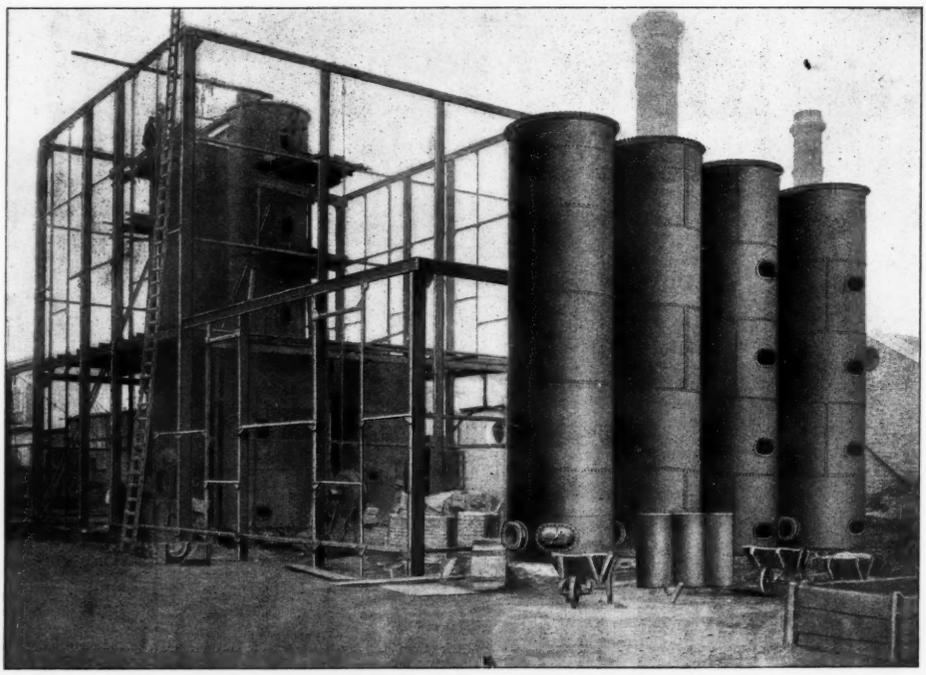

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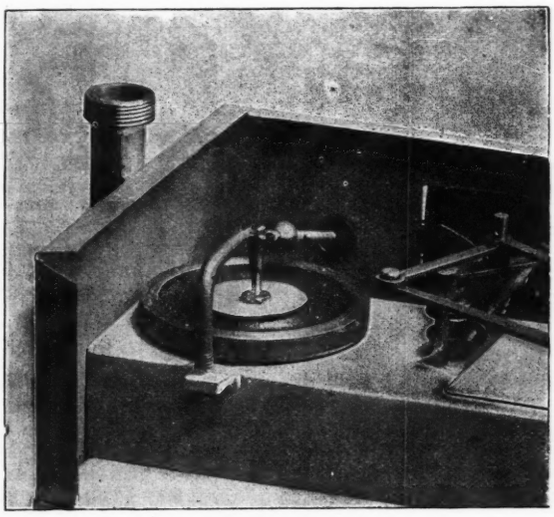

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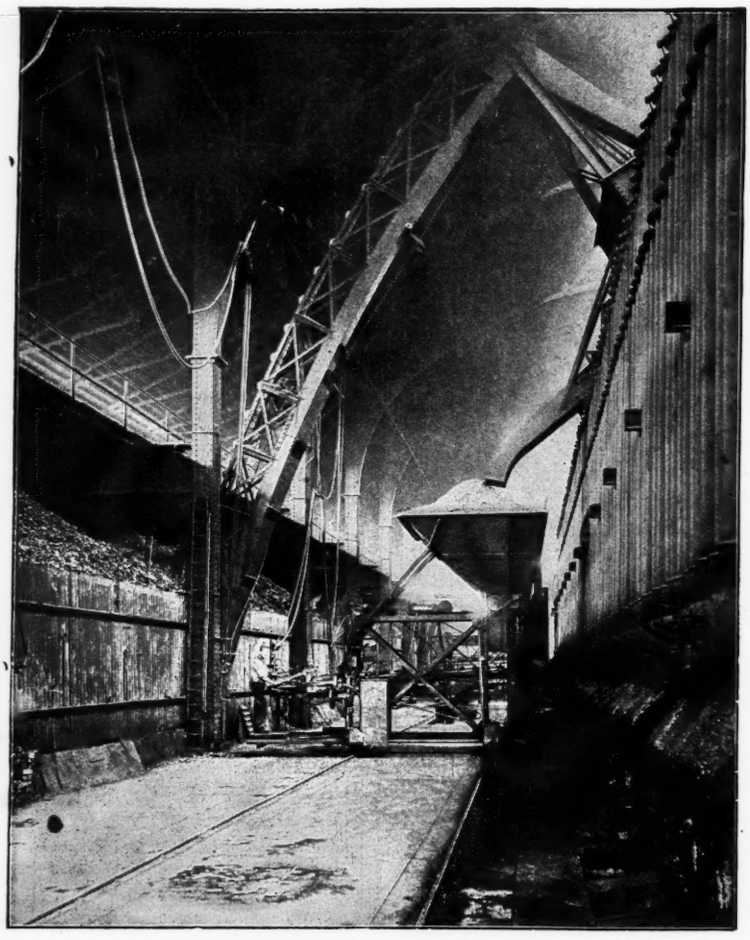

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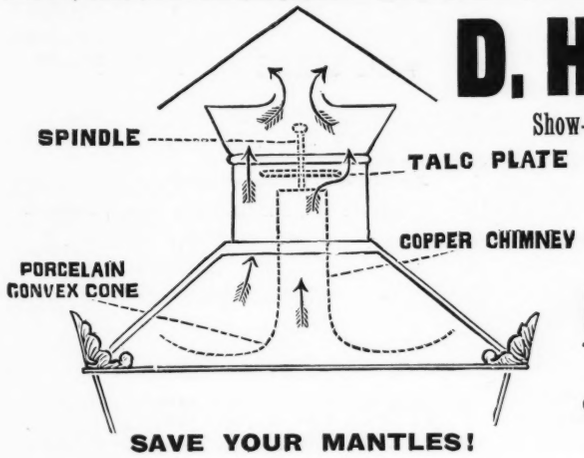

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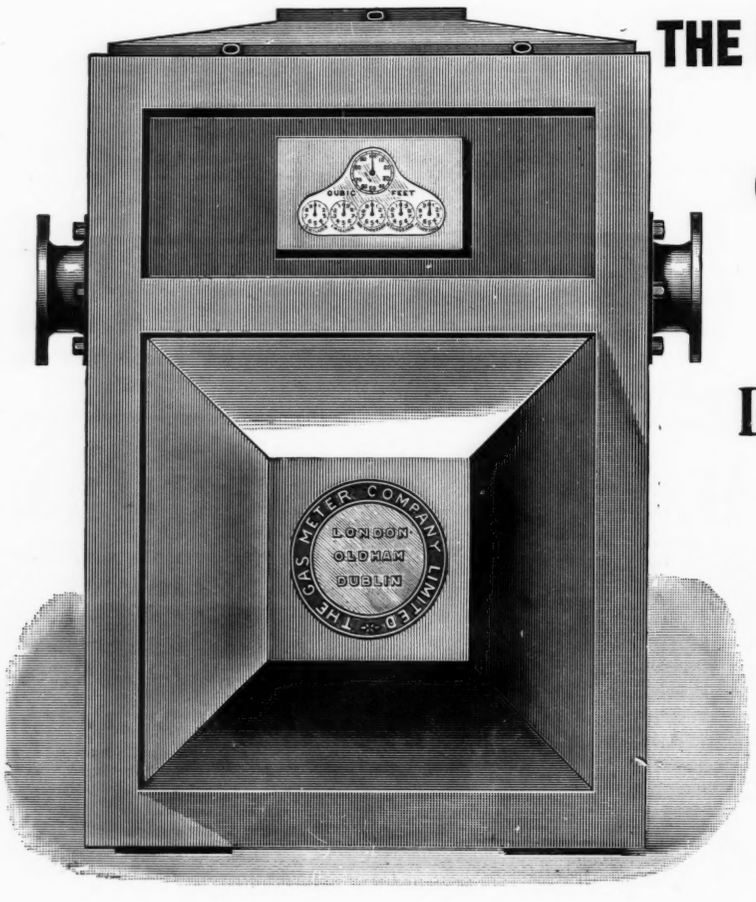

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CONTENTS.

EDITORIAL NOTES.

GAS, &c.—

The Vertical Retort Working at Dessau . . 15
The Saving Power of Naphthalene Relief . 16
The Iron and Steel Institute 17
Manufacturers and the Price of Gas for Power—An Interesting Educational Experiment at Longwood—The Lesson of an American Strike—The Labour Troubles of the States—An Ancient Company in Modern Guise. 17

The Dessau Vertical Retort 19
The Electrical Exhibition 21
Electric Lighting Memoranda 22
The Old and the New Works of the Portsea Island Gas Company 24
Concentration of Energy in Coal Gas . . . 32
Gas-Engine Accidents 33
The Conciliation (Trade Disputes) Act . . 34
Proposed New Water Regulations 35
Gas Stock and Share Market 36
An Interesting Day-School Experiment. By J. H. Brearley, of Longwood 36
The Analysis of Spent Oxide. By H. Leicester Greville, F.I.C., F.C.S. 37
A Combined Methane and Coal Gas Apparatus. (Elworthy and Williamson's Patent) 37
The Gas-Fire Season 41
Popular Lectures at the Newcastle Exhibition 42
The "Empire" and other Lamps 44

LEGAL INTELLIGENCE.

Unlawfully Disconnecting a Meter 45
The Liability of Prepayment Meter Consumers 45

REGISTER OF PATENTS.

Manufacture of Gas for Illuminating, Heating, and Power Purposes, and Apparatus therefor—Elworthy, H. S., and Williamson, S. . 44
Apparatus for Automatically Lighting and Extinguishing Public Gas-Lamps—Greig, D., and Chandler, S. & J. 44
Gas-Cooking Apparatus—Cox, G. J. 44
Inverted Incandescent Gas-Lamps—Wolff, L. 45
Burners for Incandescent Gas Light—Weickart, T. H. W. 45
Patent Notices 45

MISCELLANEOUS NEWS.

The Sale of the Halifax Tar-Works . . . 46
The Gas Exhibition at Newcastle-on-Tyne . 47
The Price of Gas to Manufacturers. . . . 47
Devonport Corporation Gas-Works — The Erection of the Carburetted Water-Gas Plant 48
British Gaslight Company, Limited . . . 48
Ilford Gas Company 49
Leeds Gas Workers and the Unemployed . 49
Gas, Electricity, and Water Supply at Leicester 50
Fatal Boiler Explosion at a Gas-Works . . 50
Rochdale and Leeds Gas Coal Contracts . . 51
Bolton Corporation Gas Supply—Depreciation on Gas Cooking-Stoves. 51
Gas Supply at the Antipodes 51
Gas at a Cape Industrial Exhibition . . . 51
Electric Light Failures 51
The Water Supply of Edinburgh 52
New River Company, Limited 53
Stock and Share List 53
Regulations in Regard to Water Supply—The Work of the Joint Committee. 54
Water-Mains under Hilsea Creek 55
New Water Supply for Vienna 55
The Position of the Acetylene Industry . . 56

MISCELLANEOUS NEWS (*continued*)—

Notes from Scotland 57
Current Sales of Gas Products 58
Coal Trade Reports 59

PARAGRAPHS.

Junior Institution of Engineers 19
Obituary. 23
Proposed Association of Foreign Municipal and Sanitary Engineers 23
Copper as a Germicide 35
The Jäger Purifier System—North of England Gas Managers' Association—The Destruction in the Baku Oil-Fields 36
A Novel Advertisement of Gas Stoves and Fittings 41
Factory Fire Caused by Electric Wires . . 44
Regulating the Seal of Hydraulic Mains—Increased Storage for the Tonbridge Gas Company 45
Exmouth Gas Company 47
Gas *v.* Electricity for Public Libraries. . . 51
Assessment of the Birmingham and Rochdale Water-Works. 52
Sale of Shares 59
Coventry and the Bedworth Gas Supply—Gas *v.* Electricity at Ingleton—Conditions of an Acetylene Loan—Electricity or Gas-Works Purchase at Bourne—Ippleppen Water Supply—Hanley Water Supply . . 60
Sulphur in the Tottenham Company's Gas—New Water Supply for Middlewich—The Proposed Lighting of Scalby—The German Incandescent Gaslight (Welsbach) Company—A Reduced Profit at Dorking—Aldershot Gas and Water Company—Municipal Ownership in Chicago 61
St. Helens Corporation Accounts 62

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VOL. XCII., No. 2212.—TUESDAY, OCTOBER 3, 1905.

EDITORIAL NOTES—GAS, &c.

The Vertical Retort Working at Dessau.

FOR a week now our readers have had in their possession Dr. Bueb's interesting description of the Dessau vertical retort-settings, and the results of their working. That this patient and persevering investigator and his colleagues are satisfied with both the latest form of construction and the results of the operation of the retorts, is evidenced by the fact that the Doctor says, in his concluding observations to the gas engineers assembled at Dessau on the 20th inst., that he and those associated with him are "now able to bring before "the public and recommend the settings as trustworthy and "well tried in working." The statement is one which we feel bound to consider as showing a maximum of confidence founded on a minimum of experience. At the same time, we should like to subscribe to the acknowledgments on the occasion referred to of the indefatigable and thorough research—made possible by the talented chief of the German Continental Gas Company (Dr. von Oechelhaeuser)—that has been prosecuted at Dessau to subjugate the difficulties attending the carbonization of coal in retorts set vertically. Time, expense, and care have not been spared. That the difficulties have been many are apparent from the lengthened period expended in the investigation, as well as from a remark made by Dr. Bueb in his address that "we had to rebuild our experimental setting five "times in the course of the last two years, before we "finally succeeded in erecting one which behaved well "in every respect in practical working." This statement is destructive to the assertion as to the well-tried trustworthy attribute of the settings. But let it not be thought we are suggesting that Dr. Bueb is sailing under false colours in this matter; for he himself makes it clear that the whole period of working which has established this trustworthiness does not exceed three months. Had results never so good been published by Dr. Bueb, we should have unhesitatingly said that the time-period alone was insufficient for their decisive acceptance. What do we yet know as to the durability of retorts working under such unusual conditions as these? What do we yet know as to the retorts maintaining their shape in the rougher treatment of daily operation, so that there will constantly be free evacuation of the spent charges? And how do we know that, as the retorts advance in service, subjected as they are to the high temperatures referred to, they will give of themselves even so good an account as Dr. Bueb has presented us with after only three months' use? More information is wanted; and with that time alone can favour the gas industry. We, at all events, would not have been among those, curious as we were for information, to reproach the investigators at Dessau if more time had been consumed, after they had attained a form of setting which they regarded as trustworthy, in obtaining a satisfactory test as to reliability. More experience will be required on this head before gas engineers generally will be disposed to join in the chorus of praise to the note set by Dr. Bueb in his communication to the engineers who were the guests at Dessau on the 20th inst.

What are the results that the working of the Dessau verticals have set before us? It may be said at once that so far they are disappointing; and that there is really nothing in them that suggests anything superior to what can be realized in horizontal or inclined retort working. For all small advantages there are compensating disadvantages. The Dessau retorts are 13 ft. 1 in. long; and they are charged with 10 to 11 cwt. of coal, which takes eight to ten hours to work off. Therefore, a time-saving in carbonization is not effected; for it is an easy matter to carbonize 6 and 7 cwt. charges of Westphalian coal in through horizontal or inclined retort-settings in five hours, and even less with higher heats, and get excellent carbonizing results. There is the volume of gas produced; and here, again, we fail to find any superiority. With Westphalian coal, the make of gas, with the Dessau vertical retorts, varies from 11,124 to 11,842 cubic feet. Dr. Drehschmidt, in his Berlin experiments with 9 ft. 2 in. horizontal retorts, obtained 11,500 to 12,574 cubic feet of gas from Westphalian coal. With half Durham and half Silesian coal, the late and deeply lamented Mr. Edward Drory was telling us in the "JOURNAL" in 1902 that he was then getting 11,000 cubic feet per ton of coal in his 15 ft. 9 in. inclined retorts at Mariendorf; and in an article which appeared in March last year, he wrote that his returns were 11,700 cubic feet per ton. The gas-producing quality of the coal employed by Mr. Drory is not greatly dissimilar to that of Westphalian gas coal. Admitting again that Mr. Drory's retort is of rather greater length than that of the Dessau verticals—but, be it remembered, the charges are lighter—he stated in his article of March, 1904, that he was realizing per retort 15,200 cubic feet of gas per day as against the 14,120 cubic feet which each Dessau retort takes credit for, and which we suspect, reading between the lines of Dr. Bueb's communication, is the greatest yield per retort "within "sight." In his article of 1902, Mr. Drory reported that the fuel account for his inclines was equal to 12 per cent. by weight of the coal carbonized, when he was making 15,000 cubic feet per retort; Dr. Bueb states that, when the Dessau settings are fully at work, the fuel account is equal to 14 per cent., making 14,120 cubic feet of gas per retort. Of course, there are other considerations than the bulk-production; but that is the principal factor in these days, when illuminating power does not count for so much, especially in the cities and towns of Germany, and when tar and other residuals, through plentiful and still increasing output, do not give such a rich financial return as formerly per unit of yield. Thus, in respect of gas production per ton of coal or per retort, the Dessau verticals have not shown the superiority expected, compared with ordinary systems of working; and they fall considerably short of the experimental yield results, published by the inventors and also by Professor Vivian B. Lewes, of the Settle-Padfield vertical retort system in this country, and of the experimental results, too, of the Woodall-Duckham system which promises great things, but about which we must wait for full information until results are confirmed.

The next point concerns the illuminating power of the gas, the average of which is given at 13·40 candles. This, like the production, is not high; but we cannot lay hand at the moment on the illuminating powers of gas from Westphalian coal, so that we will not make much of the figure. In connection with it, however, Dr. Bueb informs us that he has established with certainty the fact that the illuminants are not decomposed by his system of working—that a "cold core of "coal continues to exist in the interior of the retort nearly "up to the end of the carbonization; and that this core "serves as an exit passage for the gas and tar evolved by "the carbonization of the coal." The word "nearly" shows that there is, at any rate, an admitted appreciable space of time within which the illuminating constituents of the gas would have to pass through a red-hot portion of the charge. The drawings indicate that the retorts are tapered; so that the heats must be very perfectly regulated to each part of the retort if that green core is continued with the accuracy described throughout the charge. The charge being greater in thickness at the bottom than at the top of the retort, the bottom part of the retort should be hotter than at the top to ensure proper and uniform carbonization, and to maintain the green core. However, Dr. Bueb speaks positively of having attained such perfection in the regulation of the heats as to exactly correspond to the varied requirement in the length of 13 ft. 1 in. of vertical retort. In the Settle-Padfield experiments, not only higher yields but illuminating powers have been obtained from South Pelton slack, the characteristics of which are not greatly unlike those of the Westphalian gas

coal; while in the Woodall-Duckham system now undergoing trial in this country, production has exceeded that of the Settle-Padfield retort, with illuminating powers equal to a quality of gas very generally supplied in Germany.

A reference in Dr. Bueb's communication to the experiments at the Mariendorf Gas-Works with the Dessau system reminds us that it is nearly twelve months since any information was vouchsafed at a meeting of the Imperial Continental Gas Association as to how these experiments progressed, and, so far as is known, no step has been taken at Mariendorf in the direction of the adoption of the system on a practical scale. Dr. Bueb, however, has let us into the secret of the delay. The retorts at Mariendorf are 16·4 feet long; and "the greater "length of the retort," the Doctor himself informs us, "entails some changes in the heating arrangement." Considering the length of the experiment at Mariendorf, the difficulties in the heating arrangements must be difficulties indeed; and, if (as some people suppose, but Dr. Bueb says not) there is any depreciation in the illuminating quality of the gas with the shorter length of vertical retort, how much more would it be so, especially with the heating arrangements in an improper condition, with a retort an extra 3 feet long. The reason for Mariendorf wanting the greater length of vertical retort is easily discerned. The figures given by Dr. Bueb as to the area occupied by his vertical benches and the results achieved with those benches, when brought into relation with the figures we have quoted from the writings of the late Mr. Edward Drory on his inclined retort work, leave little room for doubt that the aim of the longer vertical retort has been—as it must be—to excel what has been accomplished with the inclines; and, in view of what Dr. Bueb says, we can only assume that the aim has so far missed its mark.

These various considerations suggest that there should be a suspension of judgment in regard to the Dessau results, which admittedly are full of technical interest; and that, until positive results from the work now proceeding in two distinct quarters, and under distinct methods, in this country are available for comparison, no gas engineer should commit himself. We have no interest in decrying the Dessau system or in supporting any other; nor, although we have been somewhat critical, are we prepared to say that out of Dessau a higher efficiency for the verticals cannot come. All we do say is that, if what we have before us in Dr. Bueb's report represents the zenith of perfection in his system, there is nothing, taking all things into account, to choose between that system and the trustworthy and well-tried machine-worked horizontal or inclined retorts as operated to the best advantage. All we want—if they are to be obtained by a vertical system, then no matter whether that system comes from Dessau, from the North-East or South-West of England, or from any other quarter—are the best possible carbonizing results in the common interests of the gas industry; and this has been the object of the work of Dr. Bueb and his earnest associates. Dessau, however, notwithstanding the dogged determination that has been shown, cannot yet claim any distinction in this regard.

The Saving Power of Naphthalene Relief.

When the Chairman of the Leicester Corporation Gas and Electricity Committee (Mr. Edwards) a year ago gave public utterance to the prognostication that the washing of the Leicester gas with a certain grade of solvent—which the Engineer and General Manager (Mr. Alfred Colson) had discovered to be possessed of particular activity in completely relieving their acute trouble from naphthalene deposition—would represent to the department a saving of at least £5000 a year, there was a great shaking of professional heads, and even an unconcealed disposition to ridicule; while others exercised a very proper reserve in the matter until such time as the prediction should be verified or otherwise. Of course, to the system of washing gas by oil Mr. Colson preferred no title whatever; his whole claim being concentrated in the solvent itself. This, however, is a matter that has been discussed to infinity; but as the subject is one which has an uncommon arousing effect, it is necessary to keep the point well in the foreground of all references. Beyond this, the genesis of the system and the originality or otherwise of Mr. Colson's discovery do not concern us on this occasion; the present sole duty being to direct attention to the experience at Leicester and to the claims as to the financial effect.

The past half-year's finances of the Gas Department were placed before the Council at their meeting on Tuesday last; and they will be critically examined with the view of ascertaining, if it be possible, how far the prophecy as to financial effect has been fulfilled. For an outsider, it is difficult from the figures, and without knowing more than the speech of the Chairman discloses as to the variations of working that have produced decreases in costs and increases in production and so forth, to assign the proportions that may be fairly attributable to change in manufacturing operation consequent upon the relief obtained from naphthalene trouble. But there is one revelation in the Chairman's interesting statement upon which all gas engineers and managers who have suffered, or who are suffering, from naphthalene can approximately place a money value as gauged from their own experiences, and that is in respect of the saving in outlay upon labour entailed by naphthalene stoppages and the saving in loss resulting from diminished consumption of gas during the continuance of the partial or complete stoppage, to say nothing of the loss of custom for which the annoyance may be at times responsible. In this connection, we have this significant fact, that whereas during the three years 1901-3 there were 58,504 stoppages in the town, throughout the area supplied from the Aylestone Road works there has not been a trace of naphthalene since it was first got rid of; and with regard to the old Belgrave Gate works (where readers will remember that for a short time Mr. Colson sprayed the solvent into the main), there have been only a few isolated cases, averaging not more than one per day. It will be remarked from the Chairman's speech, however, that the washing apparatus was put into operation at the Belgrave Gate works at the end of June last; and therefore it may be fairly expected now that the isolated cases spoken of will, as in the Aylestone Road area, quickly disappear. In this immunity from naphthalene trouble, there is a financial saving that is patent to everybody; and upon the immunity Mr. Colson, his Committee, and the consumers are to be congratulated. In obtaining it, it is also clear, Mr. Colson is satisfied that there are no accompanying drawbacks, but that, on the contrary, he has in the system an effectual agency for realizing an all-round higher efficiency.

This is where the outside critic is pulled up, and must accept or reject, as the examination of the figures prompts him, the estimate offered by Mr. Edwards (let us assume as, in this regard, the mouthpiece of Mr. Colson) as to the influence that the exemption from naphthalene difficulty has had in putting upon the balance of the accounts what must be admitted to be a remarkable excellence in view of the receipt-curtailing conditions of the half year, and which excellence, therefore, has been largely realized through the diminution of working costs. Through a recession in the sale of gas owing to the badness of trade and short-time working in the factories, and through what the Chairman describes as the phenomenal decrease in the receipts for residuals, the total drop in the revenue in the half year was £10,323. On the other hand, there was a decrease in the expenditure for coal of £6259, and for oil and coke £813, which decreases, the Chairman states, are "due almost "entirely to the naphthalene difficulty having been removed "by Mr. Colson's invention." There were other considerable decreases in expenditure, among them being in carbonizing wages £2413, and in distribution £1398. The outcome was that there was an increase in the balance to the amount of £1942 to carry to the profit and loss account; and, after meeting interest and sinking fund, the net profit was greater by £1520 than that of the corresponding period of last year. The total net profit was £23,524; and as the net profit of the first half of last year was £22,005——this being a record result—the Town Council of Leicester and the ratepayers have the satisfaction of knowing that, despite the adverse trading influences of the first six months of the present year, the gas undertaking emerged from them with a profit that again breaks the record. To come to the point, it is seen from Mr. Edwards's statement that the savings which the changed circumstances with regard to naphthalene have enabled the department to make are computed to amount to £6283 in the half year, which multiplied by two gives £12,566 for the year. This makes the original estimate of £5000, which was received in certain quarters with derision, look somewhat diminutive. The foregoing computation having been made upon working data now

actually available, and not anticipated as before, there is no doubt that Mr. Colson will be prepared to justify the statements to any Thomases there may be in the profession on the point of the extent of the saving power of naphthalene relief in Leicester. There is this that can safely be said: If the difficulty of old had continued in the first six months of the year with the direct expenditure it entailed, the half year would not have broken the record in regard to net profits; and if the whole of the attributed saving can be substantiated, then without that saving the net profits would have been several thousands below the previous record. Other large centres are, it is known, trying the washing system with the Leicester solvent; and their experiences will in due time be welcomed. Meanwhile, Mr. Thomas Glover's with the "rapid chilling" of gas in the vertical tubular water-cooled condensers at Norwich (to which allusion was made last week) must not be overlooked, in view of the position he occupies in connection with the work upon the problem of the suppression of the naphthalene nuisance.

The Iron and Steel Institute.

THE meetings of the Iron and Steel Institute are of importance and interest to all who are engaged in constructional work, because they mark the progress and development of an art on which success in construction largely depends. Especially so is this the case with regard to that branch of the art which is devoted to the manufacture of steel; and therefore it is not a little to be wondered at that the meeting which has just taken place in Sheffield is the very first which the Institute has held in that cradle of the great steel industry. Thoroughly cosmopolitan in its character and composition, the Institute has held its meetings in turn in nearly every capital of Europe, and has twice crossed the broad Atlantic; in addition to which visits have been paid to all the important centres of the iron industry in this country. But Sheffield, until this year, has remained unvisited. Now, however, this apparent neglect—from whatever cause it may have arisen—has been fully atoned for by a meeting of exceptional importance and interest, presided over by a world-renowned Sheffield steel manufacturer, in which the discussion of technical matters of the greatest importance was—not inappropriately—relieved by brilliant social functions, and instructive visits to the various hives of this particular industry in which the neighbourhood abounds.

Not the least interesting feature of the formal welcome which was accorded to the Institute by the Lord Mayor of Sheffield and other civic dignitaries was the part taken in it by the President of the Federated Trades Council, who, on behalf of that body, extended to the Institute a cordial invitation. He rightly described his position in this respect as unique; but it is one which is well worthy of imitation. The oftener employers and employed can be brought together, whatever be the platform they eventually occupy, the better chance there will be of their arriving at a common understanding, and the better will it be for the industry which they happen to represent. It is specially necessary that there should be this understanding as regards the iron and steel industry, having regard to the great and increasing competition to which this is now subject, in consequence of the development of the industry on the Continent and in America. To those who believe that this competition can only be successfully met and overcome by greater attention to both technical and scientific education on the part of employers and employed alike, the paper which was read at the meeting by Professor Arnold on the Metallurgical Department of the Sheffield University must have proved to be of exceptional interest. From this it appears that experience has taught the authorities that the day has gone by when iron and steel metallurgy could be properly taught "with an equipment con-" sisting of an assay laboratory, a blackboard, and some "chalk." As the result, during the last few years, complete steel-making plant on a working scale has been provided; while the chemical assay laboratories now provide accommodation for 102 students working at one time. The aim of the University is to turn out the students fully equipped for taking important and responsible positions at the various works; while, in order to show that research work is by no means neglected, it was stated that since 1889 the staff and students of the metallurgical department have published about thirty original researches. The author—and through him the University of Sheffield—was heartily congratulated on the system of teaching described, by representatives of the science of metallurgy from Birmingham, London, and Berlin; while the excellence of the system was further evidenced by the highly technical paper which followed, by the same author and Mr. A. McWilliam, also of Sheffield.

Another aspect of the question which is raised by mention of competition was presented by Mr. Bonar Law, M.P., Parliamentary Secretary of the Board of Trade, who was the chief speaker at the dinner given to the Institute by the Local Reception Committee. Mr. Bonar Law is esteemed as one of the most able of the adherents to Mr. Chamberlain's policy of fiscal reform; and it was only to be expected that he would seek to improve the occasion, so far as the circumstances of the gathering might permit of. He dwelt upon the fact that, whereas twenty-five years ago the quantity of pig iron produced in this country was very much the same as now, and this production pretty accurately represented the output generally of iron and steel, in the interval the production of the whole world had more than doubled. He appears to attribute the comparatively stationary attitude of this country in the face of the great development which has taken place elsewhere to the lack of combination among British manufacturers, who have been taught to rely upon individual effort. He failed, however, to point out how combination at home could possibly prevent the development of resources abroad—how, for example, British manufacturers could have hoped by any means in their power to retain their hold upon the American market for pig iron, in face of the determination of the Americans to avail themselves of the splendid—in fact, unrivalled—resources at their command. In another direction he did good service by calling attention to the great need of first-rate business men for the conduct of affairs of state—thus, unconsciously perhaps, endorsing Lord Rosebery's demand for efficiency in administration. That such need is both great and pressing, will not be denied by any one, of whatever political complexion; but how this is to be supplied, it is not by any means easy to determine.

Manufacturers and the Price of Gas for Power.

The present week is, so far as we can call to mind, the first occasion on which the report of the Directors of a Cycle Manufacturing Company has contained matter calling for notice in the pages of the "JOURNAL;" but as will be seen from matter appearing elsewhere in this issue, one of these concerns has at last raised a point which just at the present juncture is of the greatest possible interest to our readers. The Company referred to have works at Birmingham; and the Directors in their recently-issued report call the attention of the shareholders to the price that they have to pay for gas used for manufacturing purposes. They consider the rate charged—1s. 10d. per 1000 cubic feet, less 5 per cent.—is so high that it will be advisable for them to put down a private gas plant. Of course, the usual "comparative table" is given, without any regard whatever being paid to the factors which govern the prices at which gas is supplied at the various places named. The Directors may possibly urge that these factors are no concern of theirs; but nevertheless they have everything to do with the fixing of the charges in the different towns. As was to be expected, a reply to the remarks contained in the report was soon forthcoming on behalf of the Birmingham Gas Department; and we publish some statements made on the matter by Mr. G. Hampton Barber, the Secretary, to the representative of a local paper. Mr. Barber's arguments, in turn, have given rise to a good deal of correspondence in the Birmingham Press; and one of these letters we also reproduce. Mr. Barber says he has challenged the Chairman of the Cycle Company to show guaranteed figures proving that the Company could make gas cheaper than the city sold it; and he expressed his readiness to discuss the question of comparative cost with anyone who was thinking of setting up a producer plant—being satisfied he could show that it would not be advantageous to make the change. The Birmingham Gas Department must, of course, decide at what price they can afford to sell their commodity, having due regard to the conditions which apply to their undertaking; but the discussion will serve as a reminder (and there are still cases in which such a reminder is really needed) of the necessity that exists for gas undertakings to do all they can to retain the custom

of the power user. By a somewhat strange coincidence, the principal seat of the cycle-making industry—Coventry—has just been discussing a proposed reduction in the price of gas supplied for motive power; the chief argument adduced in favour of this step being the necessity of meeting the competition of suction gas plants. It transpired, however, that the Committee were by no means unanimous in recommending the reduction; and so the matter was referred back to them for further consideration.

An Interesting Educational Experiment at Longwood.

In another part of the "JOURNAL" will be found an account, by Mr. J. H. Brearley, of Longwood, of an interesting experiment which has been initiated by the Directors of the Company of which he is the Engineer and Secretary in the cause of education. Briefly, it is a scheme for enabling the boys in the two highest standards in the day schools of the town to visit the gas-works, under the supervision of an adult teacher, and have the various processes connected with the manufacture of gas explained to them, and afterwards hear a short address on the history, &c., of gas lighting. The boys will be expected to write an essay on the visit; and for the best of these three prizes will be awarded by the Company. Thus the boys will be encouraged to use their powers of observation and description at an age when the mind is generally receptive and the memory retentive. Excellent as the scheme was considered to be, it was recognized that it possessed one weakness, inasmuch as it did not give the girls a chance. Of course, it was not supposed that they would evince a keen desire to become acquainted with the operations of the retort-house; but inasmuch as the senior girls are taught plain cookery, usually with the aid of a gas-stove, it was thought that they would not be altogether uninterested in the fuel they employed. Accordingly, cookery classes have been formed, in which the various uses of the gas cooking-stove, boiler, and iron will be demonstrated by the Cookery Mistress; and a prize will be awarded to the girl doing the best work in each "section" of eighteen. The Board of Education of the West Riding County Council have expressed their approval of the schemes, and they are to be tried in six elementary schools in the Company's district outside the county borough of Huddersfield. There will be accordingly six visits a year, extending over an hour each; and it is thought that but little extra work will be thrown upon the officials of the Company. The expense in prize money will be about one guinea per annum for each school. The idea originated with Mr. Brearley; and it was brought into definite shape with the assistance of the master of one of the day schools in the town. The scheme has been inaugurated with every prospect of success. Indeed, it has aroused so much interest that there is already talk of extending it to all the principal industries of the district. The idea is unquestionably a good one. Boys will generally take a far greater interest in manufacturing operations which they can witness than in those of which they obtain information from what Mr. Brearley not inaptly calls the "cold type" of a school reading-book. The Longwood Gas Company are giving the boys in the elementary schools of the town an opportunity of familiarizing themselves with operations which fifty years ago were carried on almost as secretly as those of the alchemist, and encouraging them, by the award of prizes, to record clearly and accurately what they know about these operations. It will be for the lads to profit by the privilege extended to them. We must confess to reading with satisfaction that the scheme includes cookery competitions, with prizes, for girls. Now that what used to be called "accomplishments" are included in the *curriculum* of the public elementary schools, and taught at the expense of the general body of ratepayers, it is satisfactory to find that they have not crowded out cooking; and the Directors of the Company are to be heartily commended for encouraging skill in this "accomplishment," which we are old-fashioned enough to think is of some importance in the preparation of the future wife of the artisan and labourer for her work in the world, seeing that upon it the happiness and well-being of the household so largely depend.

The Lesson of an American Strike.

There is a lesson to be learnt from the recent disastrous—especially from the men's point of view—teamsters' strike in Chicago, resulting in the formation of a permanent association by the employers there, the object of which was to employ non-Union men and to conduct the business of the three hundred or more concerns involved in the strike. Similar results have accrued from ill-advised struggles precipitated by Trade Unions in this country; and there can be little doubt that this fact has exercised a restraining influence upon the actions of the Labour Leaders on our side. The same thing will, it is pretty safe to assume, be witnessed in the United States; and if this is so, the terrible fight that has been waged will bring benefits far beyond the smashing of the particular Union concerned—great an achievement as this was. The cost and suffering involved by the strike has, of course, been enormous—how great, is shown by a correspondent of the "Financial Times" in the course of an article published a few days ago, which gives an interesting description of what was, the writer says, one of the fiercest labour conflicts the world has ever known. The strike, it will be remembered, was brought on by the Teamsters' Union in Chicago; and it is asserted that it owed its origin to a conspiracy of several corrupt Labour Leaders to extort blackmail from a well-known firm. The struggle, after lasting some four months, finally ended in the total surrender of the Union, which hitherto had been considered the most powerful association in the city. In the fighting which it caused, 21 persons lost their lives, and about 500 were injured. The loss in business to the employers has been estimated at about $15,000,000; and in addition to this they paid about $3,000,000, in connection with the army of "strike-breakers" imported from all parts of the country. The strikers lost in wages nearly $1,000,000; while extra police cost the Corporation almost $500,000. About 900 arrests were made in connection with the strike; and among the prisoners were 48 officials and members of Unions, who are now awaiting trial for conspiracy and violence. Out of about 5000 teamsters who have struck, not more than 1500 have been able to get back to their old positions; while it is asserted that many of the remainder have become professional criminals, having been initiated into crime during the struggle. Notwithstanding the expense and blood-shed involved, the defeat of the Union is considered the greatest industrial blessing that has ever happened to Chicago. For years everyone has been in constant fear of this Union. A small strike in almost any industry would, it is said, give the teamsters an opportunity to assert "sympathy" by initiating a strike of their own, unless the leaders were paid cash to hold their men back. Even the huge outbreak which brought about the downfall of the Union, did not, it appears, arise over any alleged grievance of their own, but was in connection with a strike of garment workers in the city. It was therefore quite time that this particular organization was brought to its senses.

The Labour Troubles of the States.

But bad as all this is, however, our contemporary's American correspondent has an even more serious aspect of the Labour question in the States to reveal. He says that the Grand Jury investigations in connection with the indictment of officials and members of Unions above referred to have elicited most astounding conditions of corruption in Chicago industrial circles; it having been found that for years strikes and labour difficulties had been trafficked in as ordinary chattels, and were called on and off for money considerations. Prominent business men have regularly bought the favour of the Unions—some for protection, but others for altogether reprehensible reasons. One instance cited is that of the President of a local Brick Trust, who has been indicted along with the Labour Leaders for having used the teamsters' organization as a means for crushing out of existence any independent brick manufacturers who dared to do business in opposition to the Trust; and another case which occurred some years ago is even more interesting. It appears that there was a teamsters' and janitors' strike against every office building in Chicago that used natural gas instead of coal for heating purposes. The former would not permit supplies to be brought in; and the latter declined to allow the lifts to be operated. The result was that the places were "boycotted," and finally natural gas was banished. Now it has been stated before the Grand Jury that this strike was financed by a prominent coal company of the city! If employers have really been making such uses as this of the labour organizations, it is impossible to feel much sympathy with them in the strike trouble just experienced; nor can one be much astonished at the Teamsters' Union having

become such a menace to the industrial welfare of Chicago. The employers will probably be much more careful in the future in regard to their dealings with the Unions; the Unions will most likely be less ready to tempt Providence by engaging in strikes on every conceivable opportunity; and, perhaps most important of all, it is to be hoped that the workpeople themselves will learn to place less reliance upon their self-dubbed "Leaders," who have been the cause of so much misery to them. Things are done on a big scale in America; and with regard to the business methods of that country there is a good deal that is worth learning. But if all that the correspondent of the "Financial Times" says be true, there is also a good deal which we should be sorry to see imitated on this side.

An Ancient Company in Modern Guise.

The appearance, in another part of the "JOURNAL," of the report of the proceedings at the ordinary general meeting of the New River Company, "Limited," last Thursday gives rise to some curious reflections. The oldest of the London Water Companies has practically ceased to exist, owing to their water undertaking having been acquired by the Metropolitan Water Board; but, by a kind of metempsychosis, its spirit survives in another body. Everybody who is conversant with the water supply of the Metropolis knows the history of the New River Company—how, when the Corporation of London had obtained powers to bring water from Hertfordshire to the Metropolis, and were too timid to exercise them, Hugh Myddelton undertook the work, and carried it out successfully with the assistance of the King and certain "adventurers." It is getting on for four hundred years since the New River water was first brought to London; the works having been completed on Michaelmas Day, 1613. The Company was constituted by Royal Charter three years later; and under it the undertaking was carried on till it passed, by the provisions of the Metropolis Water Act, 1902, into the hands of the Metropolitan Water Board. One would have thought that the possession of this Charter, and the fact that the Company were the pioneers in providing London with the inestimable blessing of a good supply of water, would, as the Governor (Mr. H. C. B. Bowles) remarked at the meeting, have "stood them in good stead when they came to be bought out." Unfortunately it did not. As a matter of fact, they came out of the arbitration proceedings worse than any of the other Companies, getting only £45 for every £100 claimed. The effect of the transfer of the property on the shareholders was strikingly put by one who had suffered to the extent of £1513 by the transaction; his holding in the Company, which was formerly worth £4360, having depreciated to £2847. This should surely satisfy the most inveterate enemy of the Water Companies. The decision of the Arbitrators, however, which, though unsupported by the Court of Appeal and the Lord Chancellor, was upheld by the House of Lords, was adverse to the Company on the question of dividend; and they have suffered in consequence. But apart from the water undertaking, the Company possessed landed estate and house property, which, of course, did not go to the Water Board; and it is to manage these and distribute the water stock received from the Board that the present Company was formed under an Act obtained last year, in accordance with the special provisions contained in the Act of 1902. According to the statement of the Governor, the undertaking enters upon its new life with good prospects, which we trust, bearing in mind the history of the Company, may be fully realized.

Junior Institution of Engineers.—A visit of the members of this Institution recently took place to the Staines reservoir communication works. It was arranged with the object of affording them the opportunity of inspecting the works in an almost completed state—a visit having been paid some time ago, when all the operations of construction were seen in progress. The members were shown round by Mr. Joseph Francis, the Engineer of the works, Mr. C. W. Pettit, representing the Contractors (Sir John Aird and Sons), and Mr. Durham, of the Metropolitan Water Board. The filtered water will be pumped through a 42-inch main to Cricklewood (13½ miles), where it will be again pumped 3¾ miles to a service reservoir at Fortis Green, Finchley, at a level of 298 feet above Ordnance Datum. At the conclusion of the visit, the members were entertained at tea by the Contractors, and the acknowledgments of the Institution for all the arrangements made were expressed by Mr. Adam Hunter (the Vice-Chairman), and were responded to by Mr. Francis and Mr. Pettit.

THE DESSAU VERTICAL RETORT.

WE gave last week (p. 807) a translation of the communication in which Dr. J. Bueb described the character and working of the vertical retorts which have been erected to his design at the Dessau works of the German Continental Gas Company. The visitors who assembled, at the invitation of the Company, on the 20th ult. to listen to Dr. Bueb's description, and to witness for themselves the charging and drawing of the retorts, constituted a distinguished gathering of Continental gas men; and the assembly and the discussion which took place after Dr. Bueb had delivered his address call for more extended notice than could be given them last week.

The German Continental Gas Company's technical staff was naturally well represented on the historic occasion. In addition to Dr. von Oechelhaeuser, the General Manager, and Dr. J. Bueb, the Chief Chemist, there were present also Herren F. Schäfer, Faehndrich, Kemper, and Niemann, the Company's Engineers, Herr Reister, the Chief Constructing Engineer, and other officers and members of the Board of Directors. The technical staff of the Imperial Continental Gas Association was also well represented by the following managers of stations of the Association: Mr. Brender-à-Brandis, of Antwerp, Mr. W. Drory, of Frankfort-on-the-Maine, Mr. Körting, of Hanover, Mr. E. Körting, of Berlin, and Mr. H. Salomons, of Brussels. Among the many managers of German gas-works who were present, the following may be named, on account of their being especially well known, personally or by repute, to their English colleagues: Herren Dieckmann, of Madgeburg, Friedrich, of Darmstadt, von Feilitzsch, of Brunswick, Pippig, of Kiel, Seemann, of Leipzig, Dr. Leybold, of Hamburg, and Dr. Schütte, of Bremen. The gas industry outside Germany was, however, also well represented, as the following names of some of the foreign visitors will indicate: M. Burkhard, M. Des Gouttes, M. Roth, and Herr Zollikofer, Managers respectively of the gas-works at Lucerne, Geneva, Berne, and St. Gall; Herren Bolz and Sospisio, the Managers of the Buda-Pesth and Trieste Gas-Works; M. Gautschi, of Basle, Dr. Lunge, of Zurich, Mr. Marshall, of London, Herren Menzel and Walter, of Vienna, and Dr. Ott, of Zurich. Other well-known names occur in the list of between eighty and ninety persons who were able to accept the invitation of the Company; but we need now only mention, in addition to the foregoing, Dr. H. Bunte, the distinguished Professor of Chemistry at Carlsruhe.

The Company's guests were made welcome in the first instance at a reception held on the evening of the 19th ult. On the following morning, all met at the gas-works at about eight o'clock; and groups were formed, each under the guidance of one of the Company's Engineers, for visiting the new retort-house, in which the installation of vertical retorts is situated, and of which we give a general view on the next page. The drawing and charging of the two settings of vertical retorts, which have now been in regular operation since the end of May last, were witnessed at the hours of 9 and 11.30 a.m. and 2 p.m.; and opportunity was thus afforded for close observation of the construction and the behaviour of the plant. Of the 20 vertical retorts then in operation, 15 were drawn and discharged in view of the visitors; the whole procedure occupying about 10 minutes for each five retorts. The opening and closing of the retort mouthpieces, the sliding out of 8 cwt. of hot coke apiece and its removal by the De Brouwer conveying trough [see illustration], the extraction of pitch from the collecting main, and the clinkering of the generators, all went on in a most satisfactory manner in sight of the guests.

The company then made a tour of inspection of the central workshops, devoted to the manufacture of gas cooking and heating apparatus and gas-meters; but they also contain pipe and brass foundries. There was also open to inspection the now disused setting of six large horizontal retorts of rectangular cross section and 1 ton capacity each. These had been charged, when in use, with powdered and damped coal moulded to a shape; and they served to yield both good coke and good gas. But they were discarded eventually in favour of the vertical retort.

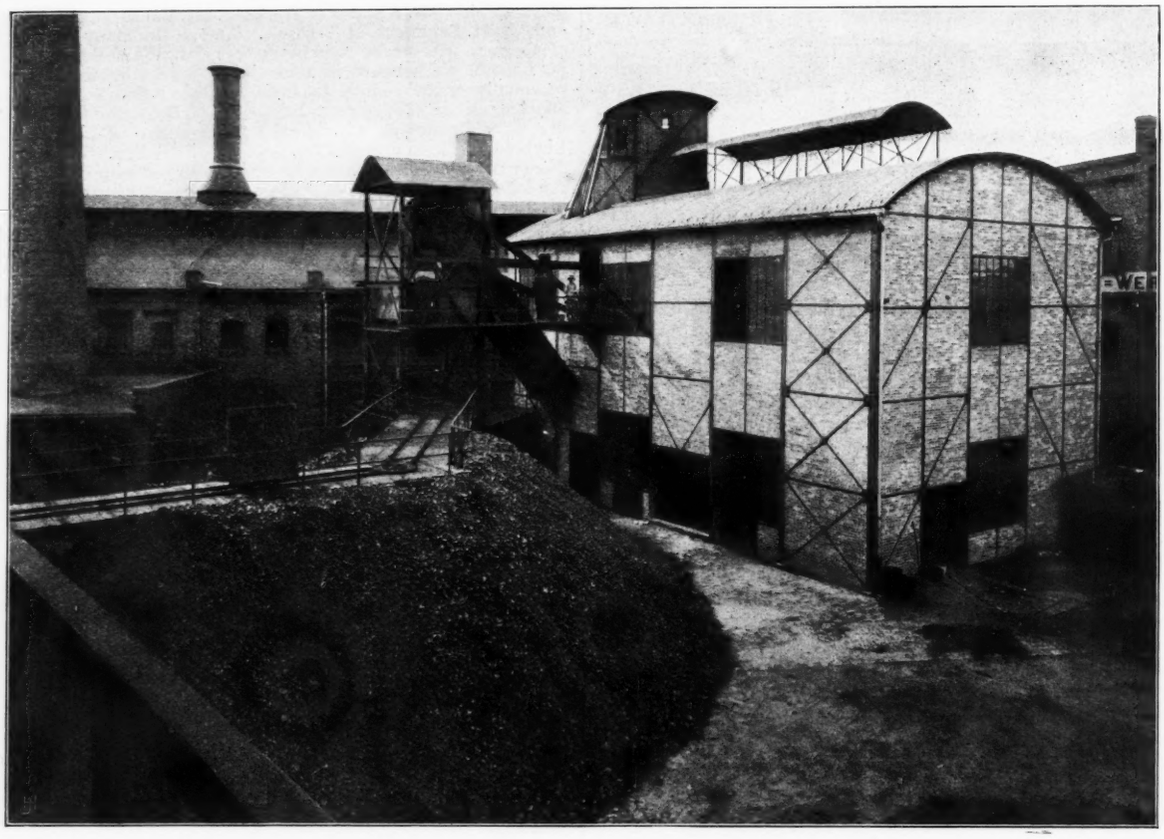
After lunch, the visitors met at 3 p.m. in the large hall at the Company's offices, and were heartily welcomed by Dr. von Oechelhaeuser, the General Manager, who presided. He referred, in a short speech serving to introduce Dr. Bueb to the company, to the fact that thirty years ago Dessau had attracted many gas men to see the first retort-setting with producer firing, designed by Herr W. Oechelhaeuser (the speaker's father). About ten years later, it again became a centre of interest to gas engineers, in consequence of the putting into operation there of the first electricity supply station working with gas-engines. Some ten years later still, the opening of the gas-tramway attracted the notice of the industry to Dessau. Now the German Continental Gas Company presented the technical world with another novelty in gas manufacture. Larger units, economy of capital, and saving of labour were the objects for which they chiefly strove; and he was grateful to Dr. Bueb for his persistence in pursuit of those objects. It was his (the speaker's) hope that the results of Dr. Bueb's endeavours would benefit not only the Company but the whole gas industry, in both a scientific and a practical manner. These introductory remarks of the distinguished General Manager of the Company were received with acclamation; and Dr. Bueb then delivered his address, of which the translation was published in last week's "JOURNAL."

At the close of the address, the Chairman invited discussion upon it; and Herr Körting, of Hanover, opened with an inquiry as to whether a higher pressure prevailed in the lower than in the upper part of the retorts. Dr. Bueb replied that, shortly after charging, the pressure in the lower part of the retort amounted to about 4½ inches; but it soon fell to the normal pressure of about 1·2 inches. In any case, it did not appear to be harmful, as the visitors had been able to see that the lower retort mouthpieces remained tight.

Dr. Leybold, of Hamburg, asked as to the reason why Upper Silesian coal had proved inapplicable in the vertical retort. Dr. Bueb explained that the coal from the Königin-Luisen Mine evolved its gas too rapidly, was thus swelled up very greatly, and so was pressed tightly against the walls of the retort. The column of coke, after carbonization, remained hanging to the walls. Dr. Bunte explained that a coal of this description acquired soon after charging the condition of a thin fluid; whereas ordinary gas coal only fused on its upper surfaces. It was not, however, to be feared in consequence that such coal would continue to be inapplicable to the new mode of carbonization. It was only necessary to mix it with a little poor coal. There was a scientific explanation of the higher yield of ammonia obtained with the vertical retort. Finally, he would suggest that it might be possible, in order to provide still larger units, to make the retorts longer, or somehow to convert into one the two retorts which now stood one at the back of the other. Dr. Bueb said it was necessary to be cautious in this direction, and not to expect too much of the fire-brick material. The manufacture of longer retorts, and the erection of a greater number in one bed, were quite reasonable conceptions; but he would recommend only a careful and gradually progressive advance towards them.

Herr Körting, of Hanover, expressed gratification that the Dessau system of vertical retorts, which had been much talked of for two years among technical men, and had been regarded on all sides with such close attention, had now been thrown open to public inspection. The gas industry was greatly indebted to Dr. Bueb for his perseverance, and to the Dessau Company for their disregard of the high cost of the trials. All those present signified their hearty concurrence with this expression of gratitude by rising and applauding.

Professor Lunge, of Zurich, said he felt some diffidence in adding his testimony to the appreciation which had also been expressed by much more competent lips. He only desired to join Dr. Bunte in his remarks on the chemical and thermal conditions. He could support what Dr. Bueb had stated as to the conditions of formation of cyanogen and naphthalene. He had, indeed, been



View of the Vertical Retort-House at Dessau, showing the Coke-Conveying Plant.

somewhat disconcerted when he heard that such a high temperature prevailed in the lower part of the retort; and he would have feared two disadvantages therefrom—viz., that the retorts would not last so long, and that the gas would be impoverished. He was, however, now satisfied that the latter failing did not exist, because the evolved gas passed away through the core of the charge of coal, and thereby assisted carbonization, since the dry distillation of coal was an endothermic process. As to the durability of the retorts, it was not possible at the time to speak with any certainty; but he had convinced himself that there was no deformation of those which had already been in operation for upwards of 100 days. Having regard to the downward pressure and the call upon the retorts in respect of heat transference, it might have been expected that softening would have occurred and resulted in such deformation. He thought, therefore, that they might reasonably expect that the vertical retorts would have as long a life as inclined ones. In Zurich the latter were guaranteed for 700 days, and often their life extended to 1000 and more working days. Clearly only the very best material would be used in making the retorts. He had one question to put—viz., Would it be possible to carbonize in the vertical retorts the mixture of three-fourths Saar and one-fourth Ruhr coal, which was usually employed at Zurich?

Dr. Bueb answered the last question in the affirmative. Different mixtures of coals had, he said, already been satisfactorily carbonized at Dessau. He would like to supplement what he had stated in his address by mentioning that at an earlier stage of the Dessau operations experiments had been made on the introduction of steam into the vertical retorts. With the present settings this would not be possible, as they were designed to solve the main problem only in the first instance. But he was confident that still further and considerable advantage might accrue from the introduction of steam. He did not share the fear that the retorts would be injured by the steam, as it was even now produced in the retorts directly after they had been charged with damp coal. In the earlier trials, steam had been introduced during the latter half of the period of carbonization, and a considerable increase in the volume of gas had been secured, without damage to its calorific value, and with only an inappreciable deterioration of its illuminating power. He was pleased to observe that at the present time energetic attempts were being made to solve the vertical retort question, not only in Germany, but on several sides in England—as, for instance, by Messrs. Settle and Padfield and by Mr. Woodall. He hoped that reports would shortly be published as to the results achieved in these cases.

Herr Zollikofer, of St. Gall, referred to the make of gas per square foot of retort-house area working out at 262½ cubic feet, and stated that, according to information obtained, the inclined retorts at the new gas-works at St. Gall yielded only 187 cubic

feet of gas per square foot. Herr Francke, of Hagen, inquired whether the retorts had so far at any time developed cracks; and, if so, whether they had been patched from above or below. He further asked how scurf was removed from the retorts. Dr. Bueb replied that the retorts could be patched either from above or below. The retort scurf was removed very simply by opening the two mouthpieces of the retort and loosely covering its upper end with a couple of slabs, so that a gradual passage of air through the retort took place. A workman whose face was protected by a mask could thus, after some hours, easily knock out from below the thin scale of retort carbon. The retort scurf had to be removed about once in five weeks. There was considerably less scurf than with horizontal retorts.

Herr Kobbert, of Königsberg, made some observations, based on his own experiences, as to the relation between the proportion of moisture in coal and the yield of ammonia. Then, after Dr. Bueb and Professor Lunge had made some further short remarks, Dr. von Oechelhaeuser brought the discussion to a close. He first referred to Professor Bunte's suggestion with regard to the enlargement of the retorts, and pointed out that the question involved not merely the durability of the retorts but also the removal of the coke. Difficulties would be encountered in this direction, because neither the width nor the rate of travel of the trough conveyor could be forthwith increased. He then went on to say that, with a view to the further extension of the new system of retorts, the German Continental Gas Company, working together with the Imperial Continental Gas Association, the Berlin-Anhalt Engineering Company and the Stettin Fire-Brick Works, had founded a separate Company for the further development of the system on the best lines. This Company was known as the Dessau Vertical Retort-Setting Company, and its headquarters were at Berlin (2, Marburgerstrasse). Any further information would be willingly afforded to those interested in the matter by this Company, who, of course, would be enabled to show the settings which were at work. Dr. von Oechelhaeuser then closed the proceedings with an expression of hearty thanks for the courtesy shown that day towards the German Continental Gas Company, and with the hope that the expectations associated with the system might proceed to fulfilment.

Some 85 of those present afterwards participated in a repast at the "Goldenen Beutel." Herr Körting, of Hanover, in proposing the toast of the German Continental Gas Company, spoke of it as the stalwart supporter of progress in the gas industry. Dr. von Oechelhaeuser, in replying, pledged good-will among the gas men of all civilized nations.

As mentioned in the second paragraph of this article, Mr. H. Salomons, the Engineer of the Brussels station of the Imperial Continental Gas Association, was present at the inspection of the new settings of retorts; and we learn that he was favourably impressed with the system. In the course of a letter we have received he says the result of the working of the benches was "entirely satisfactory;" the charging and discharging being performed without a hitch, and with the minimum expenditure of time and labour. He adds: "The quality of both tar and coke appeared splendid, and certainly would command higher prices than that produced from other systems of benches. There only remains to be seen whether the resistance of the retorts and benches shown during nearly four months' work will persist, which there appears no reason to doubt. It will also be interesting to see if the same good results will be obtained from the 5 metres high retorts now being tried at the Mariendorf works of the Imperial Continental Gas Association at Berlin as from the 4 metres high ones at Dessau." Mr. Salomons looks upon the interest that is being shown in the system by the German Continental Gas Company, the Imperial Continental Gas Association, and such firms as the Berlin Anhaltische Maschinenbau Actien Gesellschaft and the Stettiner-Chamotte Fabrik, as indicative of its prospective value.

A trial of the tar macadam is being made by the Shoreditch Borough Council in the Hackney Road. A short length has been laid first with a layer of ordinary broken granite, well saturated with tar and rolled in, then a layer of granite chippings steeped in tar. This is covered with a dressing of powdered stone and rolled level.

The Institute of Chemistry of Great Britain and Ireland have forwarded a copy of a scheme which the Council have prepared for examinations they propose holding in industrial applications of chemistry, in respect of which certificates will be granted. The examinations will be open only to Fellows, and to those Associates who have been registered for at least one year; and they will comprise the following: (1) The application of well-known chemical and physical laws to industrial purposes; (2) the development, control, and transmission of power and heat; (3) the operations and plant used in industrial works for the treatment and handling of materials, finished products, waste products, and effluents; (4) the properties of materials affecting their application to the construction of plant and apparatus in chemical works; (5) the interpretation of drawings of chemical plant, and the making of dimensioned rough sketches; (6) the calculation of working costs, and the clerical work in connection with manufacturing operations. All candidates will be expected to give evidence of a general knowledge of chemical technology.

THE ELECTRICAL EXHIBITION.

OLYMPIA for exhibition purposes, it is found, has at any rate one disadvantage, and it is that, as all trains running on the underground railway westwards from the City do not go to Addison Road, the missing of one train for that present Mecca of electricians may consign the traveller to the fate of having to find occupation for the mind in the best possible manner on a subterranean platform. This may be a partial explanation of the fact that the public are not evincing any intention of favouring the exhibition with the exuberant attention that they bestowed upon the Gas Exhibition, and which fact we may also claim to be in a measure an index to the relative popularity of gas and electricity for those purposes in which they compete. For another partial explanation, we think it may be assumed that electricity suppliers in and around London have not shown such an enterprising spirit as the administrators of gas undertakings in the distribution of free admission tickets among their consumers. Furthermore, after the lukewarm accounts that the daily Press accorded the opening of the exhibition, it is not in the least surprising that their part in encouraging public interest has not to the present been a great one. There is no doubt that the show has not realized anticipation. There is prettiness, and there is brightness; but there are so many things in the show that are not pretty, so many lamps that are not bright, so many stands that are black patches in comparison with neighbouring ones, that the gentleman of the daily Press and the gentleman from the street each has no difficulty in determining that what prettiness and brightness there is, is only the reward of a profuseness that does not accord with the depth of every man's pocket. Saturday night is a good time for forming some judgment of the degree to which popular taste has been catered for; and the best patronized parts were found to be the café chantant, and it ought not to be said, but truth must prevail, at the refreshment bars.

There is another reason for mentioning the refreshment bars, because they, from a cause other than that of refreshment, were bound to claim attention from any observant chronicler of gas affairs. The exhibition, representative though it is of the great electrical industry, has, unconnected with the café chantant and the "entrancing" electrophone, its humorous side. Over the refreshment bars, and up at any rate, one if not all the stairways leading to the galleries, there is an "exhibition" of naked gas-lights in proximity to electric lights. This particular exhibition consists of a few roaring flat-flame gas-lights through burners that were without question made in a long distant past. We have not the slightest doubt that, if the authorities of the exhibition, or whoever is responsible for this, will permit, there are among our readers many enterprising individuals who will gladly convert those gas-jets to a more modern and rational system of gas illumination during the course of the exhibition. Again, at the main entrance to the building, just behind a flame arc light, there was on Saturday night a decrepit looking mantle and dirty burner in a street lantern such as existed in the early years of last century, suspended in a manner that gives the impression that the workman who was charged with the duty of placing it was suffering from defective vision. If these flat-flame lights and the aged incandescent light and lantern are permanent institutions at Olympia, why are they required during the Electrical Exhibition, unless it be as a protection to the public against the mishap of a failure of the electrical current? If this is the explanation, though we regretfully doubt it, then there is reason why the authorities of the exhibition should allow those who are interested in gas lighting to assist in the protection by increasing it, without further cost to those who are now so unprofitably wasting the gas. Another little piece of humour which the promoters of the exhibition have consciously inflicted upon the public, has been the greatly advertised fact that the exhibition would embrace electrical cooking exhibits. The exhibition has been searched for these; and up to the end of the week, there could be found only a few trifling examples of appliances, with commensurately trifling samples of cooked food of very pallid exterior, and less was the information that could be obtained as to the time and consumption absorbed in their preparation. For some unexplained reason, the cookery lectures were not part of last week's programme; but it is definitely announced that they were to start yesterday. Perhaps they will throw new light on the subject; but for the present it may be dismissed.

Interest in the exhibition for gas men begins and ends at the points between which the exhibits touch their business; and inspecting the display made, keeping this in view, no gas man will leave Olympia with any misgivings as to the future of his own commodity leading the way in its diverse applications. In the first place, there is little heavy or moving machinery at Olympia; but among the machinery exhibits will be found a few which will claim special observation. It is among the surprises of the exhibition that suction gas plants, combined with gas-engines, should be on view to show those who have a preference for electricity how they can obtain it at a price which the ordinary electricity supply undertakings cannot match. At the stand of Messrs. Crossley Bros., Limited, are to be seen gas-engines running—one of them being driven by the firm's No. 2 suction gas plant; and it is used for lighting the stand. The engine (with dynamo) is of the "R E" high-speed type; and it is well to note that it is capable of giving 27·5 effective horse power as a maximum with town's gas, and only 21·5 effective horse power as a

maximum with suction gas. There is the "O E" type of high-speed gas-engine, giving 16 effective horse power as a maximum with town's gas, and 12·5 effective horse power as a maximum with suction gas. This engine is worked with ordinary town's gas, and is likewise used for lighting the stand. An oil-engine is also shown. At the National Gas-Engine Company's stand, again, there are to be seen one 2 brake horse power gas-engine and dynamo, capable of serving 26 16-candle power lamps, a 6½-horse power engine, and an "S" type of engine, giving 27 brake horse power on town's gas and 21 brake horse power on suction gas. At the stand of Mr. G. Braulik is seen one of Hillenbrand's 5 brake horse power suction-gas engines. It is stated that the fuel consumption equals 1 lb. per brake horse power, and water 2 gallons per brake horse power per hour; the cost of fuel for ten hours' continual working at full load being about 6d. per day. Coupled to a 12 ampère dynamo, this plant is credited with a capacity of fifty 16-candle power lamps. Messrs. Drake and Gorham, Limited, also exhibit a gas-producer, with gas-engine and dynamo; and here the information is imparted that the plant will supply ten 16-candle power lamps for ten hours for a penny. What the penny includes, we are not prepared to say. The Diesel Engine Company are showing what they can do in the same line with their oil-engines. Interest is also arrested at the stand of Babcock and Wilcox, Limited, where working gravity bucket conveyors, automatic fillers, &c., for coal or coke are to be seen; and at that of the Temperley Transporter Company, where excellent working models of their plant are on view. Machines for weighing coal trucks or quantities of coal are shown by Messrs. W. & T. Avery. The Sturtevant Engineering Company, Limited, have on view their fans and blowers; and the James Keith and Blackman Company, Limited, their electrical ventilating-fans. Among the firms exhibiting tubes and pipes, we find Messrs. Stewarts and Lloyds, Limited, and the New Brotherton Tube Company. Messrs. Frank Pearn and Co. are displaying the merits of their pumps and air-compressors; and Messrs. E. Green and Son are showing their well-known fuel economizers. At the stand of the Davies Boiler, Limited, the opportunity is taken to announce that particulars can be obtained there of the Settle-Padfield vertical gas-retort process, and quite a respectable account of its working appears in the Exhibition catalogue. The New Asbestos Company have on view samples of their specialities. Though the exhibits are quite electrical in character, Messrs. Bruce Peebles and Co. are certain to give to all gas men a warm welcome to their stand.

Turning to the lighting exhibits, everything that is new may be seen; but nothing that is either new or old will, we feel convinced, shake confidence in the virtues of incandescent gas lighting. The flame arc lamps are, of course, the most notable of the innovations in electric lighting. It is described as "a yellow light," and the introduction to the catalogue informs the reader that it "probably gives the largest quantity of light for the power expended as yet obtained by means of electricity." That is rather non-committal; and what people really want to know is something about the total cost, at a given price per unit, of using these lamps, the cost of maintenance and attention, and the real candle powers. At the stand of the Diesel Engine Company, there is one lamp, for which an extraordinary claim is made. The visitor is told by a printed notice that this is: "The Monster 'Excello' lamp, 25 ampères—2000 watts, 20,000-candle power. Uses 4d. of electricity per hour. Cheapest light extant." The attention of gas engineers who understand something about photometry may be called to this lamp. They will leave it with a contemptuous smile; for undoubtedly someone, in respect of the illuminating power, has allowed imagination to get the better of common-sense. Messrs. Santoni and Co. are also showing some "intense" flame arc lamps; and Messrs. Oliver and Co., the "Oriflamme" arc lamps, which, being on the line of vision, have the effect of blinding one to the exhibits of the neighbouring stands. In other forms of arc lamps, improvements do not appear to have been striking. Here we may suggest that if the dirty top lamps seen on Saturday are part of the ordinary lighting arrangements of Olympia, their discontinuance would better contribute to the realizing of the objects of the exhibition. Acquaintance may be made with Nernst, Tantalum, and Osmium electric lamps; but they must be carefully looked for, or they will escape attention, as their illuminating power is not a specially attractive feature. It is rather amusing to find that, if investigation is a little deep into various matters relating to these lamps, attendants are apt to become inquisitive as to the individual making inquiry. This is objectionable and, at times, inconvenient. The Edison-Swan stand is worth an inspection if only to witness the showy extravagance. The gallery has been set apart largely for domestic lighting; but the vacancies in the gallery are equal, if not more than equal, to the occupied spaces. The furnished rooms should not be missed, because it will be found that, with electric incandescent lamps, the efficient lighting of rooms can only be obtained by liberality in number, notwithstanding what we have heard so frequently lately as to economy necessitating some curtailment of consumers' views as to requirement. To put it mildly, the gallery is disappointing. It is worth spending a few minutes looking over the exhibition from one of the end galleries, observing the thousands of lights in use; and yet, taking the building as a whole, there does not appear to be a superfluous amount of illumination—only here and there are there patches of notable brilliance. In connection with fittings, there are some beautiful examples of the metal workers' art; and at the stand of Messrs. Falk, Stadelmann, and Co., Limited, one can see all that there is worth inspecting in this line. Looking around other stands, it is remarkable how that time-honoured solecism—a candle lamp with an incandescent light in place of a wick—survives.

In regard to "heating," the electric radiator appears to have become somewhat stereotyped in form. There are a few new patterns; but, if anything, their heating capacity is worse than the old. The exhibitors agree in informing visitors that the four-tube size of radiator—a tube meaning one of the icy-looking elongated cylindrical glasses covering the source of heat—consume a unit of electricity per hour. That is dearly purchased warmth; and as on a winter's day it would be necessary to have a radiator at the front and back of a person to keep him comfortable, this mode of heating will not largely commend itself as economical.

We are afraid that the exhibition, judging from the first week's run, is not going to give to the electrical industry that impetus its promoters anticipated, nor will it, we have confidence, have a great—if any—effect in displacing incandescent gas-burners, or gas cooking and heating stoves; nor, further (the "Electrical Review" must pardon a second reference to its little editorial joke), will gas engineers, when Olympia closes its doors on the exhibition, be found wandering vacantly along the paths of humility. Maybe the "Review," at the close of the show, will be writing something of the same kind about electrical engineers.

ELECTRIC LIGHTING MEMORANDA.

The Flame Arc Lamp as an Impression Creator—The Burden of Electricity Capital in Marylebone—Consumers and Increased Voltage—The Deception of the Ratepayers by Municipalities—Maidstone's Profit and Depreciation.

THERE is room for suspicion that from remonstrance (which was something akin to adding insult to injury, after their indifferent treatment of the City in the matter of lighting) the Company responsible for the electric arc lamps in the City have fallen into a state of frenzy over the change from arc to incandescent gas lighting in certain streets. There have hitherto been in the approach from the City to Blackfriars Bridge four sickly-looking arc lights. For years they have stood there; and on the refuges in the centre, there have also been for years a couple of high-pressure incandescent gas lamps, which have been of considerable assistance to the four arc lights. Notwithstanding the Electric Light Company's protest, the setting up of the incandescent gas-lamps in Queen Victoria Street, Fleet Street, and elsewhere, has been going on apace. One result is that, towards the end of last week, the long-established arc lights in the Blackfriars Bridge approach were removed from their towering columns, and four flame arcs are now after dusk dazzling the eyes of the wayfarers and the drivers of vehicles. From one extreme the Electricity Company have gone to the other in this centre upon which five important thoroughfares converge. Of course, it is quite possible, by bringing into closeness four lamps of the high candle-power of these flame arcs, to overpower in point of intensity a couple of high-pressure gas-lamps. But this is not a test of suitability for, or economy in, sheet illumination, though it is an example of how not to do things. Lamps of such great intensity are of no use whatever for the uniform and cheap lighting of a thoroughfare. The largest part of the illumination is local; and, unless the lamps are placed fairly close together, the lighting must be patchy. The greater the local illuminating power, the more is the patchiness intensified. If the lamps are brought closely together, the cost must be prohibitive. Local authorities must be careful that they are not gulled by any meretricious display such as that in the Blackfriars Bridge approach, which is not an example of the lighting they would receive from flame arc lights if the local electric company or committee were asked to illuminate the streets at a price approximately that at which the gas suppliers could efficiently perform the service. To make free with a sentence in a recent report affecting Croydon, What does it profit the ratepayers for a local authority to buy 10,000 candles of illuminating power at 11d. per candle, when 800 candles of another kind of illuminating power at 15d. will answer their purpose? The field of the troublesome flame arcs has not yet extended beyond that of advertisement and the creation of impression. The greatest impression so far has been that they are expensive things.

The longer the Borough Council of Marylebone are in possession of their electric lighting undertaking, the heavier the financial burden becomes. For ever since the day when their hopes of financial relief in regard to the rates from trading in electricity supply were blighted by the award of nearly a million and a quarter sterling as the price to be paid for the electricity undertaking, expenditure upon expenditure to the tune each time of many thousands of pounds has been falling upon the original outlay, until now there must be, or will shortly be, at least a round couple of millions standing against the capital account of the undertaking. The disturbance of the ratepayers at the time they heard of the award is nothing compared with the uneasiness that the thinkers among them must feel now; and while certain London papers will continue to hold Marylebone up as an awful example

of reckless municipal administration and trading, the ratepayers will not be allowed to forget, even temporarily, the incubus that those who were appointed to look after and defend their interests have been instrumental in placing upon them. The mountain of expenditure upon which standing charges have to be annually met is not the culminating point. Capital expenditure will continue, and it is an altogether unknown quantity. And on top of all this is the risk which faces every trading enterprise, and which it is not right that Parliament should allow local governing bodies to take upon themselves to such a vast extent as Marylebone has done in this instance. The portentous risks that are facing this heavily burdened electricity supply undertaking are threefold. In the first place, there is the competition for electric power supply; in that line of business, too, electricity undertakings are mutually interested with gas undertakings in the second assailant of their business—the suction gas-producer; and, in the lighting branch of the business, there is the incandescent gas-light, which is becoming a veritable nightmare to the electricians. On the whole, the prospect for Marylebone's electric lighting venture is not such a fair one as the ratepayers would like to look out upon.

There is another question, also with a heavy spending side to it, affecting Marylebone. It is only just lately that the long-delayed matter of the change of pressure from 100 to a uniform 240 volts has to an extent been settled. There was a great ado about this when the proposal was first mooted. Many of the customers of the electricity undertaking had, and not without cause, grave visions of fire resulting on their premises that were wired previous to 1896, when low voltages were the rule in the district, and many medical practitioners who had instruments delicately adjusted to the low pressure cried out aloud against the wickedness of the councillors in proposing such a dreadful thing. It was impossible to refrain from sympathy with these consumers; but as conversion to a uniform pressure of 240 volts is likely (at least, so Mr. Arthur Wright says) to save the Council an additional capital expenditure of £250,000, under certain conditions the change should, of course, be made. These conditions are that the Council—or rather the Electricity Department—should bear the entire cost of putting the consumers' wires and fittings in a fit state to meet the change, and recompense any loss the consumers may incur. There was a considerable proportion of the consumers who occupied premises wired previous to 1896—1795 of them in all, and of these 750 objected to the change. This being the position, the Council applied to the Board of Trade to enable them to dispense with the consent of the recalcitrants; and more money had to fly over the inquiry, which has ended in the Board of Trade allowing the change of pressure subject to the Council paying all costs incurred in, or incidental to, making the change, as well as compensation for any consequential loss or damage. But permission to dispense with the consent of the consumers does not dispense with the consent of the insurance offices. There is a condition attaching to the decision of the Board of Trade, that there is to be no change in the pressure at which energy is supplied until the sanction to the change of the insurers of premises and property therein has been obtained; and, from remarks dropped at the inquiry, it looked as though the Council were having some trouble in reconciling the insurance offices to the new conditions. In one respect, of course, the insurance offices will be beneficiaries from the change, seeing that so many of the consumers' premises will have to be re-wired and refitted, and this will assist in ensuring safety. There is too much neglect of old electric wiring and fittings in these days; and we accept the "Electrician's" statement that in Marylebone "in many cases the wiring needs revision badly." Compared with gas-piping, the electric wiring of a house deteriorates rapidly; and to overhaul or renew it often carries with it a good deal of expense in re-decoration work caused by disturbance. The expense of renewal under the circumstances is, we are afraid, often accountable for the neglect which endangers. The cost incurred by Marylebone in the process of changing over the fittings in consumers' premises for the higher voltage is stated to be £70,000. Alas! poor Marylebone.

We know of nothing that has done so much in the way of producing corruption of public accounts as municipal trading in electricity. In the anxiety on the part of many of those who have been instrumental in bringing undertakings into being to show some sort of profit on the speculation, all kinds of expedients in accountancy have been resorted to. Not long since we saw in the accounts of an electric lighting undertaking that a nominal sum, sufficient to justify the appearance of the item, was put down for rates and taxes; it is also a common practice to favour an undertaking by giving it free shelter for its business transactions in the municipal buildings; and official salaries and clerical staff expenses are frequently largely borne by some other department of the municipal service not troubled by the necessity of producing a profit and loss account. In this way are the ratepayers hoodwinked, and bogus profits shown. The Rev. W. J. Somerville is the Rector of St. George-the-Martyr, Southwark; and he is also a member of the Southwark Borough Council. His influence, however, in that body is not so far-reaching that he can prevent looseness in their financial methods; but he has done his best in the matter, even to the extent of publicly making his protest in a London evening paper. The gravamen of his complaint is that the Council having spent £800 recently in opposing the London Electric Power Bill have decided to charge this large sum to an account unconnected with the electric lighting concern. The opposition was avowedly taken in the interests of the electricity undertaking; and therefore it ought assuredly to be a charge upon that concern. The St. Pancras Borough Council do not agree with the Southwark authority; for they on their part, have transferred from the estimates of the coming half year to the electrical account the cost of £1400 incurred by them in opposing the Power Bill—the electricity reserve fund being considered as being the proper quarter in which to sink this sum. But it is not every municipal undertaking that is in the happy position of having a reserve fund. Almost sure are we that Southwark has not, for until last year they did not make a profit, and then it was only the modest one of £300 on a capital expenditure of £85,000. Stay! was that a profit? The legal expenses of last year, we are told, were not charged to the electricity account; and the cost of the clerical staff was put down at £50, for an undertaking with a capital of £85,000! However, we are going to hear more of this unsound electrical finance in Southwark, just as we have heard a good deal about Bermondsey and the terrible financial burdens of Marylebone. The Rev. Mr. Somerville is sick of it, and threatens to protest before the Official Auditor against the misleading system of finance in his borough; and it does not look as though he will be shaken from his purpose, in view of the fact that he publicly challenges contradiction when he says that "if all the expenses connected with the undertaking were charged to the electric lighting account, instead of an apparent profit, there would be a large deficit." Southwark has numerous companions.

When Auditors take upon themselves to recommend to Local Authorities that it would be a wise thing to allocate a part or, if small, the whole of their profits to the provision of a fund for the renewal of electrical plant and machinery, Electricity Committees frequently show signs of umbrage. This is what has happened at Maidstone. Maidstone is glorying in its first profit on the municipal electric lighting undertaking. It amounts, accounting for the last penny, to the sum of £466 9s. 8d.; and the Auditor wisely thought that the time had come for beginning to make provision for renewals. There was rather a cynical ring about the remark of the Chairman of the Electric Lighting Committee when introducing the accounts to the Council, that "he did not know whether it was part of the accountant's duty to direct the business of the Committee, but still they were much obliged to him for his opinion." It is the view of the Council, however, that the Committee do require a little leading; for, while the Committee suggested that the question of the formation of a fund should be postponed until the undertaking had been working five years, the Council, by twelve votes to two, thought it better that the whole question should be referred to the Finance Committee for consideration. This Committee in turn may desire to finger the "profit" themselves. It is a great pity that matters of this kind are not decided by the experience of others. The strongest municipal electricity undertakings from the financial standpoint do not happen to be those without reserve and renewal funds. As to recommendations by Auditors, they are the first to be censured, when things go wrong, if they do not tender the advice which their professional experience entitles them to offer.

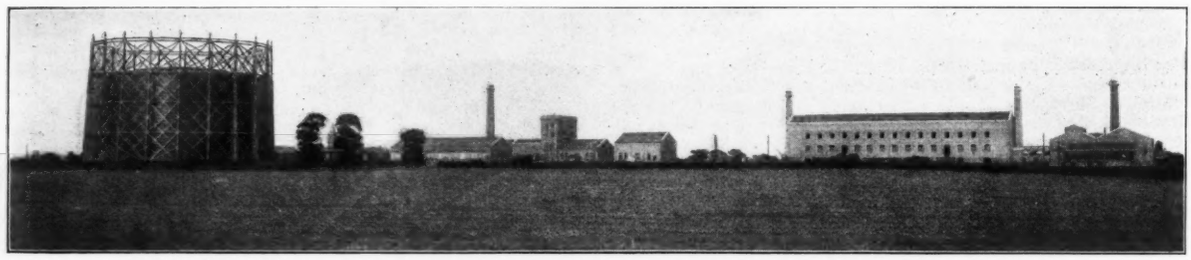
OBITUARY.

The funeral of the late Mr. R. Ashton, formerly Manager and Secretary of the Barnstaple Gas Company (whose death was noticed in the last issue of the "Journal"), took place on Saturday week at Barnstaple, and was numerously attended. The Mayor and Corporation were present in state, and the whole town was in mourning. In addition to the Corporation, representatives attended of different institutions with which the deceased was connected, and there were also present members of the Local Authorities of neighbouring towns. Both as a mark of the esteem in which Mr. Ashton was held, and as a tribute to his activity in the public service, the attendance at the funeral was remarkable. The bearers were old officials of the Gas Company. At a meeting of the Barnstaple Town Council, a resolution was passed expressing the Corporation's high appreciation of the great services for many years rendered to the town by Mr. Ashton, and of sympathy with his family.

Proposed Association of Foreign Municipal and Sanitary Engineers.—A project is on foot for the formation of a foreign Association of Municipal and Sanitary Engineers; and a meeting will be held in Paris some time next month to give the scheme definite shape. Broadly, the object of the promoters (four Municipal Engineers) is to establish a means of intercommunication between the members and their foreign colleagues, with a view to their general advancement. It is proposed to have a congress annually in different towns, at which papers will be read and discussed, and in connection with which an exhibition of improved sanitary appliances will be held, and visits paid to works. The new organization will, in fact, be founded very much on the lines of the Sanitary Institute. Should the proposal be approved, the office of the Society will be available for consultations and for furnishing information to the members. This branch of the work will be facilitated by a monthly publication devoted to scientific, technical, and industrial matters.

THE OLD AND THE NEW WORKS OF THE PORTSEA ISLAND GASLIGHT COMPANY.

Approaching Completion of the First Section of the Hilsea Works.



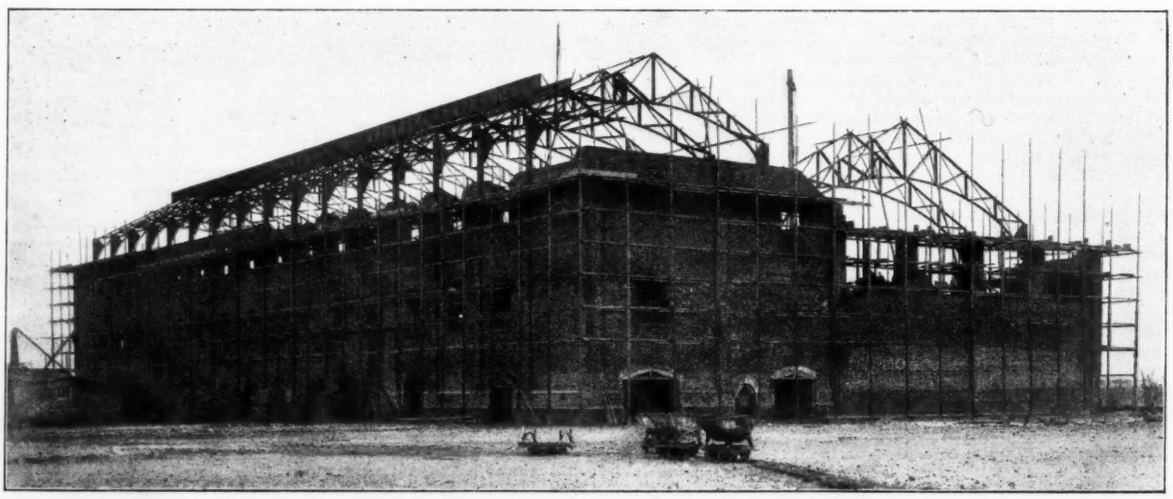
A General View of the New Gas-Works at Hilsea.

Ancient Portsmouth has taken such a large part in the making of our country's history that it holds a warm place in the affections of all Britishers; and, therefore, most things appertaining to it will attract the public interest. It is the chief function of the "Journal," however, to devote itself to one special line of industry; but we cannot claim for that line, though involving what has become a necessity in our daily life, that it has anything more than a partial interest for the public—the popular concern being confined to the question of the price of gas, the value and the convenience consumers can get from the commodity, and the beauty, strength, and serviceableness of the fittings used, as the requirements may demand. But in the case of our readers, their interests are different; and what we have to say about Portsmouth will appeal to them in a twofold way—both as Britishers and as being professionally or financially interested in the gas industry.

It is a well-worn truism that the rate of prosperity of a gas undertaking reflects the rate of the commercial prosperity of the town in which it is situated; and applying this test to the town of Portsmouth, its prosperity during the past decade must have been considerable. For from figures that Mr. J. D. Ashworth, the Engineer and General Manager of the Portsea Island Gas Company, placed at our disposal almost immediately Portsmouth was reached on a recent visit, we find that, despite the competition of the municipal electricity supply, the gas business has in the past decade almost doubled, and the number of consumers has more than trebled. To give the exact figures: In 1895, the consumption of gas was 699,530,000 cubic feet; and in 1904, 1,250,088,000 cubic feet. In 1895, the number of consumers was only 10,600; while in 1904, the total was 32,417. Running down the figures of the intervening years, it is seen that there has not been a single one in which there has been a set-back; but the ten years have shown continuous progress, and the business this year is not producing any variation in the record. Reference reminds us that it was on June 1, 1898—seven years ago—that Mr. Ashworth entered his present responsible office; and as the consumption in 1898 was 763,356,000 cubic feet and the number of consumers 12,698, calculation gives the information that no less than 80 per cent. of the increase in consumption and the addition of nearly 20,000 consumers, stand to the credit of his years of work for the Company. It is true that, notwithstanding this greatly increased consumption, the additions regarded in percentages show a decline—for instance, last half year the increase was 3 per cent. But this was calculated on a consumption almost double what it was ten years ago. How deceptive the percentage method of stating increases is, is shown by the single fact that in the year following Mr. Ashworth's appointment, the total increase in consumption was 64,409,000 cubic feet; while in 1904 it was 70,792,000 cubic feet. But though in bulk the increase was lower in 1898 than in 1904, reckoned out as a percentage upon the previous year's output, it was between 8 and 9 per cent., as compared with about 6 per cent. in 1904, when the volume increase was greater.

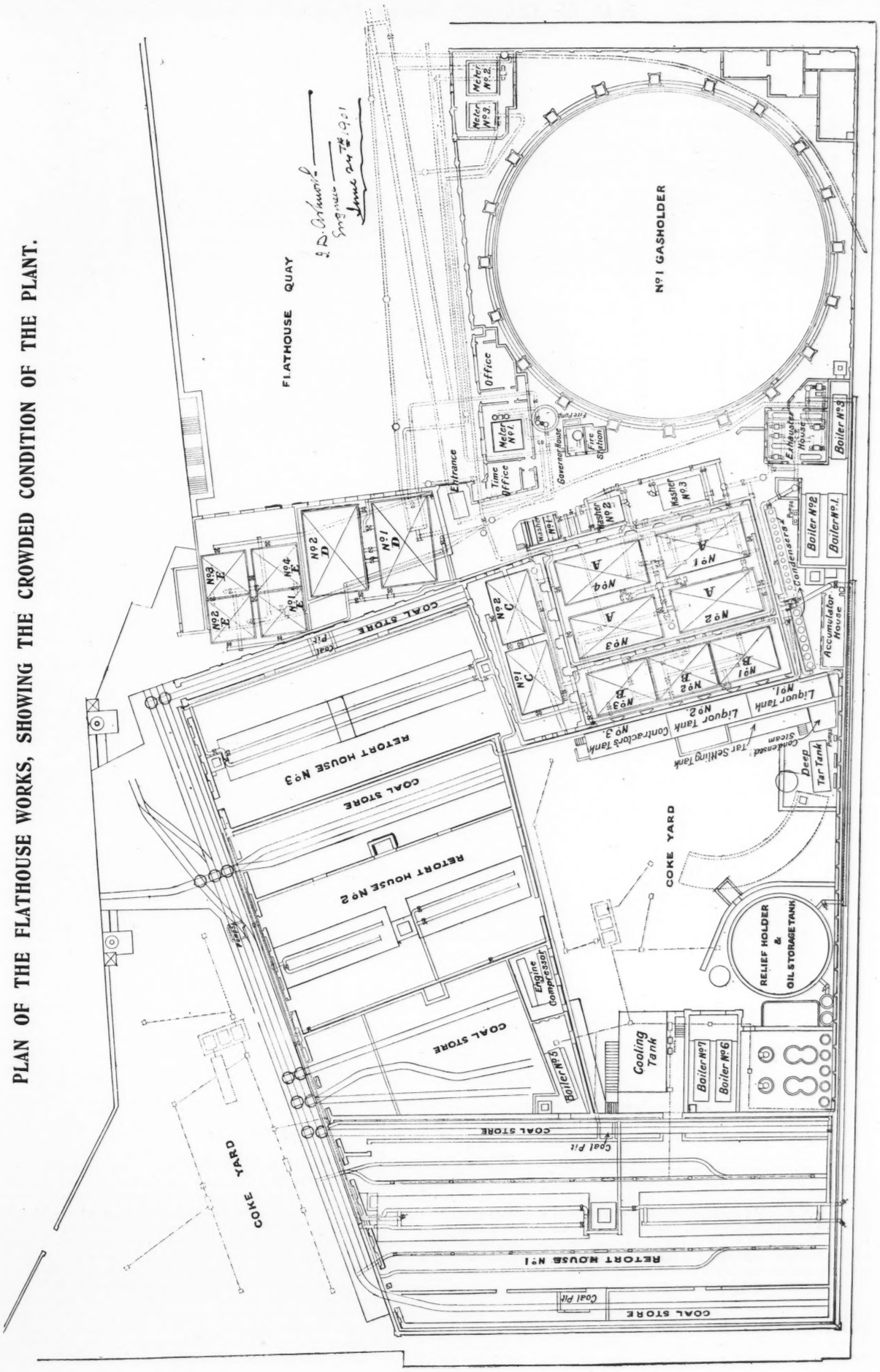
But reverting once more to the totals of increase, that the consumption has not advanced *pari passu* with the number of consumers is due to the two well-recognized causes of reduced consumption per consumer required for lighting through the incandescent burner and to the lower consumption of the prepayment consumers than of the ordinary. That, however, in passing. The figures so far given have not been later than for 1904; and the evidence that the basis of the Company's business is still enlarging is shown by the fact that a fortnight ago, the total number of consumers was 34,093 (of which 18,393 were on the prepayment system), and the total number of cookers out on hire was 21,963; so that not far short of two-thirds of the consumers are provided with cooking-stoves. Although the Corporation have their own electricity works, the Company supply with gas 2000 public lamps; and it is of interest to note that they are all fitted with incandescent burners, and there are no flat-flame burners to be found in the streets. Nothing more need be said to point the fact that the Portsea Island Gas Company have, in common with the gas industry, enjoyed continuous and remarkable prosperity during the past decade, which has been the period of the sharpest competition within its history. The Directors of the Company at this period of greatest prosperity are Sir John Baker, J.P. (Chairman), Mr. R. Edgcombe Hellyer (Deputy-Chairman), Mr. Howard Charles Ward, J.P., Mr. Charles Cole, Mr. F. Marks Aylen, and Mr. Reginald J. E. Baker, B.A.

While dealing with the growth of business, it may be mentioned that the Company have a subsidiary one known as the Portsea Island Gas-Fittings Company, Limited. The Directors are the same; and the concern is also under Mr. Ashworth's zealous management. Like the parent Company, it is highly prosperous, which means that it does a considerable business; and several advantages have been found in keeping the businesses apart in

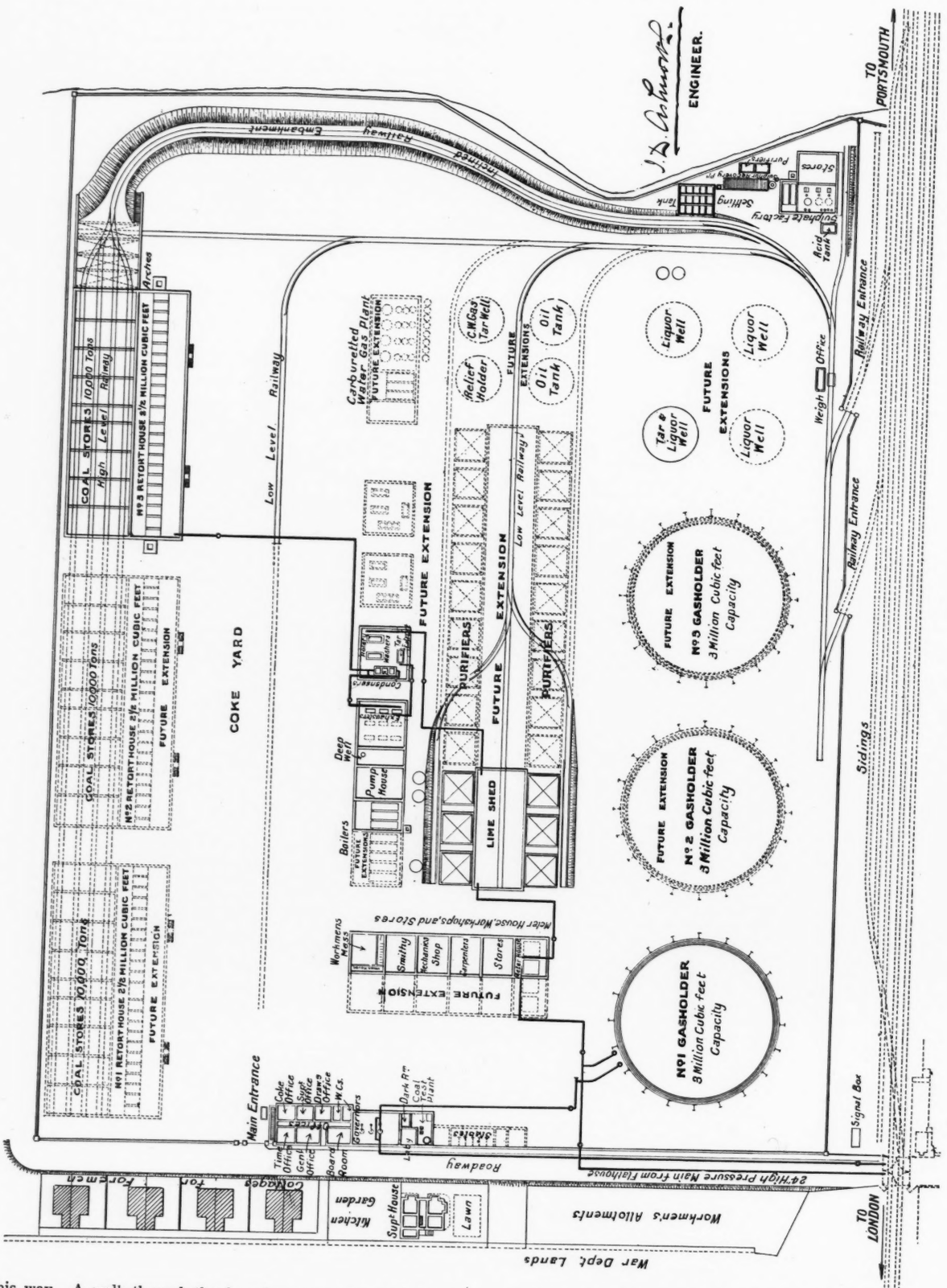


The Hilsea Retort-House and Coal-Stores under construction.

PLAN OF THE FLATHOUSE WORKS, SHOWING THE CROWDED CONDITION OF THE PLANT.



PLAN OF THE NEW WORKS AT HILSEA.



this way. A walk through the fine show-room, the workshops, stores, and other places in the building in which the Fittings Company carry on their operations—close by the distinguished and well-appointed offices of the Gas Company—affords several object-lessons.

The Old Flathouse Works.

When a Gas Company come to the position in their career that it is found imperatively necessary to construct new gas-works on a fresh site, as in this instance, one has a natural curiosity to learn something about the old works, in order to ascertain how far they were competent, as existing or by extension, to meet the growing demands. A visit to the works at Flat-house—which have served their day, and will continue to be used, though all developments will necessarily have to be made on the new site at Hilsea—ends with the impression that the works themselves well illustrate the position the Company would have been in, even perhaps in the coming winter, if they had not in 1902 commenced the construction of new works. There is no gain-saying it, the Flathouse works are in a tight corner; and that would, without the new Hilsea works, have been an apt description not many months hence of the Company's position in regard

to their ability to comply with the requirements of their extensive district, which takes in not only Portsmouth and Southsea, but surrounding townships along mains extending seven miles out. By the way, the distribution system consists of 175 miles of mains —from 30 inches down to 4 inches in diameter; nothing less being used, except for services.

The position of the Flathouse works is one that defied treatment in a manner which would have enabled the Company to proceed with gas production there without external aid. The works, which occupy an area of 3 acres, are surrounded on three sides by the Dockyard and Government property, and on the fourth by the harbour; so that outward extension was absolutely impossible. Internally, the condition of the works hardly allows of description. The plant is so compacted together, and only now just about equals, without reserve for emergency and development, a maximum day's wants, that reconstruction and reorganization has become out of the question till this can be properly done, and, looking at the plan [p. 25], it will be seen there is no spare space inside for additions. The problem here has been in the past how to pack in on the smallest possible space all the plant required; and so well has this been done that pathway between the various buildings and the contained plant has been barely provided. One cannot but admire the ingenuity that has been expended in bringing the works to their present condition, and in carrying on the work with the success that it has been carried on, under such embarrassing circumstances. It is not the state for a works that we can commend, and much less so the Engineer responsible for the working. But at the bottom of the conditions that have brought about this cramped state of affairs was the question of site; and the Directors and the Engineer were loth, until absolutely compelled, to transfer any part of their carbonizing operations from the convenience that the harbour offered for the reception of coal. With the Hilsea works in operation, however, the Flathouse works will undergo a gradual metamorphosis; and the time will come—and that not greatly distant—when they will bear little identity with those of the present, save perhaps in regard to the larger of the structures. The production is almost immediately to be dropped down 25 per cent.; and this, with the increase, will be transferred to Hilsea.

At the Flathouse works, the production of gas has been 1250 million cubic feet a year; the maximum coal gas capacity being 4 millions a day, and of carburetted water gas 1 million. The carbonization is done in three retort-houses. In No. 1 there are 19 beds of eight horizontal retorts, charged and drawn by West's compressed-air machinery. In No. 2 house, there are twelve beds of six horizontal retorts, charged and drawn by West's hand machines. No. 3 house contains fourteen beds of six horizontal retorts, which are likewise charged and drawn by hand machines. The parliamentary standard for the gas is 14-candle power; and the whole of the coal used is Durham and Northumberland. The coal storage, alongside the walls of the retort-houses, is only equal to two weeks' maximum requirements; but

Roof of the Retort-House at Hilsea during Erection.

deliveries can be made here pretty regularly, being all sea-borne. All the raw materials in fact are delivered alongside the works by steamer; and the coal is raised on to an elevated staging and transferred direct into the bunkers along the retort-house walls. The staging is a heavy wooden structure; but a steel one will in all probability replace it next year. As Mr. Ashworth incidentally remarked here, there is a lot of work to be done that cannot be started until the new works are fully running. The condensers, it is noticed in passing, are of the tower atmospheric type. The exhauster-room is typical of how crowded things are on the works; four rotary coal gas exhausters and two for water gas, with their steam-engines, being packed together in a room in a manner which makes one wonder how the work in placing them there was accomplished. The gas passes to Livesey tar-extractors; and then on through three of Kirkham, Hulett, and Chandler's rotary washing machines, each of 2½ millions capacity per day. No. 2 rotary is of the makers' latest type with the bearings between the washing compartments, which, experience to the present time testifies, is a great improvement upon the old type of machine. The coal-gas purifiers are worked in two streams; the gas passing through the lime first, and finally on to catch purifiers containing oxide of iron. There are four lime boxes in the first section; and three in the second—followed by two oxide boxes in each section for the final recovery of the sulphur compounds. The whole of these purifiers are elevated; and in their case the reagent is prepared on a floor above the purifiers, and feed through openings into the boxes, while the spent material is discharged from the sides of the boxes. The carburetted water gas is only passed through four 20 feet square oxide purifiers; lime not being used, for the sufficient reason that there was not the area upon which to put in lime boxes. These are in the open; this being better for the men at work upon them, with no real disadvantage accompanying. Before leaving the question of purification, it should be stated that the Company are under the sulphur clauses, and are limited to 33 grains per 100 cubic feet in the winter.

In reference to the carburetted water-gas plant (which, as already mentioned, has a capacity of 1 million cubic feet a day, and is of Messrs. Humphrys and Glasgow's type), an interesting feature was pointed out by Mr. Ashworth, which gives another illustration, if one were needed, of the strange expedients that have had to be resorted to to cope with circumstances. Owing to the confined space on the works, it was found that the only place for the oil storage tank—holding 119,000 gallons—was inside the relief gasholder tank. The oil tank being so situated forms an annular space in which the lifts of the relief gasholder work. The oil-inlet pipe is carried nearly to the top of the oil-tank; and the oil outlet pipe leads from the bottom. Both the gas inlet and outlet pipes are taken through the bottom of the tank and up by the side of the oil-tank to the holder. We only mention this as an unusual feature;

but a condition attaching to the allusion is that it has to be recorded that the arrangement is not one that Mr. Ashworth by any means advocates.

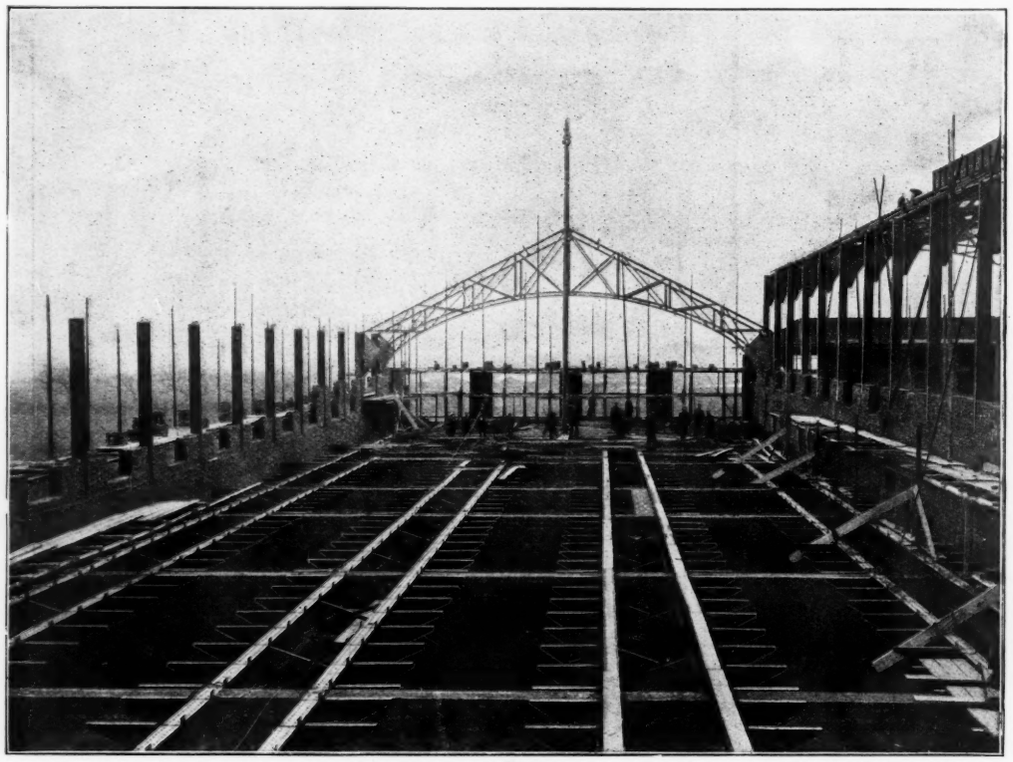
As to the station meters, there are two of 100,000 cubic feet per hour for the coal gas, and one of 45,000 cubic feet for the water gas; and one of these meters was found located in one of the rooms of the works' offices. There is a three-lift gasholder at this station of 1,600,000 cubic feet capacity.

There is another small station not far away to which we must presently turn to complete the account of the works anteceding those at Hilsea. There are, however, a few other notes which were made at Flathouse to include here. Attached to the works is a workshop, well equipped with lathes and other plant, all of which are driven by a gas-engine; and a smithy with three hearths, likewise fully equipped. Noticing an ambulance in one building, it was learned that the works possess a corps of St. John's ambulance men—eight having gained first-class certificates. The works has also its own fire-brigade, and a steam fire-pump. The men here work eight-hour shifts; and, when mentioning this, Mr. Ashworth incidentally remarked that it was found a good deal of time was saved, and comfort and satisfaction given to the men, by employing ships' cooks to prepare their food. On looking into the mess-room, at one end were seen large gas-stoves, with boilers on top; and the white-capped and aproned cook was serving out to a number of the men their own dishes of steaming hot food.

The Rudmore Works.

On the way to the Company's Rudmore station, a motor wagon was passed, bearing the Company's name, and carrying coke to the railway station; and this suggested the information that Thorneycroft motor tank-waggons are now being employed to take the ammoniacal liquor from the old works to the new for working up there.

The Rudmore station, it was found, is small, but extremely interesting; being devoted mainly to gas storage and work connected with the distribution department. The three-lift holder at this station has a capacity of 1,500,000 cubic feet; and to this holder gas is pumped by exhausters from the Flathouse works, and from here it is distributed into the district through four governors. But the plant is so arranged that the gas can now be pumped, not only from Flathouse, but to and from Hilsea just as best serves the needs of any particular time. But previous to being distributed from the Rudmore station, and before entering the governors, the gas is passed through one of Messrs. Botley's carburation plants for the prevention of the deposition of naphthalene. The result of this treatment has been to bring the complaints in the district down fully 60 per cent. Passing into the recently erected cleaning and repairing shops for stoves and meters, they are found to be extensive and light buildings, and as completely equipped as such shops have ever been seen on gas-works by the writer. The machinery employed is all driven by a Crossley gas-engine. Examining the work going on in the cooker cleaning and repairing shop, it is noticed that the operations are very thorough. Every divisible part of a cooker—and some of them stand greatly in need of it—is separated, the whole placed in cradles, and immersed in baths of caustic soda. The cookers are then rebuilt, new asbestos packing put in where necessary, and the whole finished off in a condition equal to new. About 80 stoves a week are renovated in this way. The Company also make their own tins here for stoves, repair and relacquer brass work, and in many ways find much useful employment that saves the Company greater expenditure. Again, in the meter-repairing shop adjoining, completeness reigns. The meter-testing plant is of Messrs. Alex. Wright and Co.'s make; and two new sets of plant are now being made by Messrs. Sugg and Co. There are some well-stocked stores at hand here. There is also a smithy containing three hearths. In addition to the ordinary work, the Company's horses are shod here. Over this department, as over each gas-works, a responsible superintendent is placed. Mr. Ashworth takes pride in the Company's rolling stock and their horses; and the stables at this station are inspected. Everything is found spick-and-span. It is learned that the Company have seventeen horses of their own; and they occasionally have to hire others.



Erection of Roof over Coal-Stores at Hilsea.

DESCRIPTION OF THE NEW WORKS AT HILSEA.

Owing to the enormous increase of the Company's business, the difficulties of working at Flathouse, and the trouble of getting the gas away in the manner that the Engineer would himself desire, all of which has been made abundantly clear by what has been written concerning the old works, the time has now fully arrived when new works must be put into operation. That this time was approaching was seen not long after Mr. Ashworth took over the general management and engineership of the Company. The search for a new site commenced; but it was found impracticable to secure one with deep waterside facilities. Inland, therefore, the Company turned; and an excellent site was obtained at Hilsea, adjoining the main line of the London, Brighton, and South Coast Railway and the London and South-Western Company's joint system. In 1901, the Company applied for and obtained a Provisional Order, giving them all the necessary powers for the utilization of the land; and, in accordance with the plans and drawings prepared by Mr. Ashworth, the erection of the new works was commenced forthwith—the Chairman (Sir John Baker) cutting the first sod on Aug. 8, 1901. To-day, the first section of the works—of 2,500,000 cubic feet capacity—are close upon completion; the first half of the beds being under slow fire, and the coal stores are now being stocked.

Some Features of the New Site, and Its Utilization.

The site of the new works is about 3½ miles from the Portsmouth Town Hall, and comprises an area of nearly 33 acres; being bounded on its entire western side by the railway. There

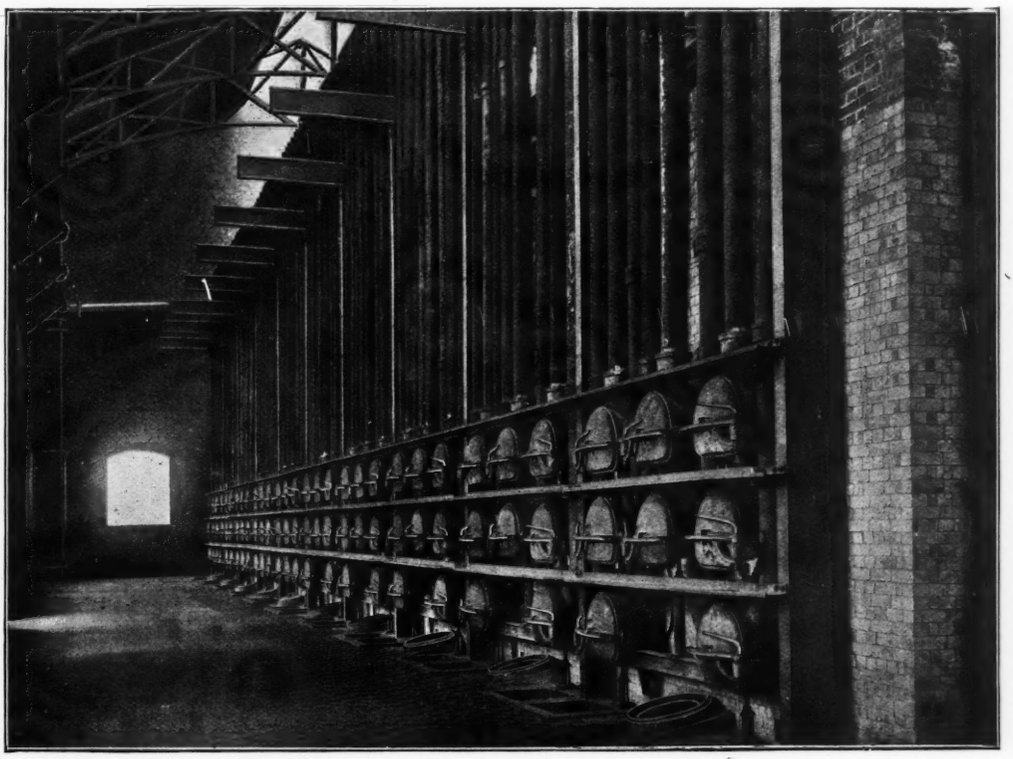
can be no question as to the excellence of the site for the purpose; and at present there is little in the way of residential property in the neighbourhood. Although the levels of the land varied considerably below the datum line decided upon—to the extent of about 8 feet at the southern, eastern, and northern sides of the works—this provided an excellent tip for the deposit of the surplus materials from the excavations; and, when completed, the yards will be practically level throughout. The works are set out on a site of 22½ acres, and are designed to have an ultimate daily productive capacity of 10 million cubic feet of gas—viz., in three complete and independent sections of coal-gas plant, each capable of producing 2½ million cubic feet per day, and a 2½ million cubic feet installation of carburetted water-gas plant. The area allowed is equal to 2·25 acres per million cubic feet of gas made. Only the first section, as mentioned, has yet been erected; the remainder will be taken in hand as required. The plan will show the disposition of the present and prospective buildings; and that Mr. Ashworth has plotted out the land to the best possible advantage we think must be generally admitted. The works are drained completely throughout, being provided with a complete system of clearing-out pits, manholes, septic tanks, and filter-beds. This work was carried out by Mr. John Croad, of Portsmouth. The boundary of the works consists of a series of concrete walls and retainers, surmounted with wrought-iron unclimbable fencing 6 feet high—gates being provided at the main entrance, as well as at the railway.

The Works' Railways.

So much for the site; but before getting absorbed in the description of the buildings and plant, we may dispose of the railways on the works. Every part of the works to or from which material has to be transported—coal stores, basement of retort-house, coke yard, purifiers, general stores, and the sulphate house—will be served by rail. The greater part of this work has already been done, and the total accommodation at present consists of 1 mile 1567 yards of standard gauge, with a 30 tons capacity weighbridge and office. There is also 359 yards of 2 ft. 6 in. gauge railway in the basement of the retort-house and coke-yard. The rails, sleepers, and other railway materials were supplied by the L.B. & S.C. Railway Company; railway waggons by the Midland Railway Waggon Company; and the weighbridge by Messrs. Hodgson and Stead. A pride of the works is a large locomotive by Messrs. Beyer, Peacock, and Co., Limited, which, during the visit, was seen pushing up the incline (rising 1 in 40) to the coal-stores four railway truck loads of coal at a time.

The Structural Work.

It was interesting to learn from Mr. Ashworth that practically all the clamp bricks required for the construction of the works were made, by Messrs. Dye and Kiln, of Portsmouth, on the site—over 5 million of them having been produced from the subsoil of the estate. The clay was first passed through a pair of 3 feet diameter rolls, and then cut up in three pug mills. After tempering, the bricks were made by hand. The concrete used for the foundations of the heavy buildings, retaining, and boundary walls, was composed of four parts by measure of sea shingle, and one part by measure of Portland cement; the concrete under the lighter buildings being composed of four parts by measure of clinker and ash-pan breeze, and one part by measure of Portland cement. All brickwork up to the damp-course level and all arches have been executed in cement mortar; the remainder of the brickwork being built with a mixture of one part by measure of grey lime, two parts by measure of sea sand, and one part by measure of clinkers. All mortar used on the works was ground in mills fixed on the site.



Northern Battery of Inclined Retort Bench containing Ten Ovens.

It will be seen from the general arrangement of the works, as shown by the plan, that they will consist of a series of buildings in single line, with broad avenues between the various blocks—ample freedom being a feature in all parts of the new works. The buildings throughout are plain in design, being slightly relieved with panels, having pilasters of one-half brick projection, with plinth extending out the same distance from the face. Surmounting the plinths and at the bottom of the panels, there are two courses of blue Staffordshire splayed weathering bricks; and, at the top of each panel, there is also a single course of blue Staffordshire square brick oversailing, having a 2¼-inch projection. The return angles of all the buildings, pilasters, and window and doorway openings, have kiln brick quoins of 9 in. by 4½ in. laid alternately. The arches are also executed with kiln bricks. The window frames throughout the works, except in the offices, are of cast iron, of one standard type and design; and all external window sills are cast iron, of hollow pattern. All the structures are of corresponding design, and have a solid appearance.

The Coal-Stores and Retort-House.

In visiting a gas-works, one instinctively turns first to the retort-house and the coal-stores; and we go to the imposing building which constitutes these, and spend a most interesting time in inspecting what Mr. Ashworth has brought together there. At a distance, the building externally has struck one as a substantial but unattractive structure, but closer acquaintance confirms the first characteristic, and shows that the architectural features are not devoid of pleasing character, which has been generally described in explaining the lines on which the buildings throughout the works have been built. It may be said at once that the superstructure of the retort-house and coal-stores, the concrete foundations for the retort-bench, the retort-house chimneys, and much of the other heavy building work on the site, was carried out by Mr. Henry Jones, of Portsmouth; while the roof of the retort-house and coal-stores was the work of Messrs. E. Wood and Co., Limited, together with the stage-floors, and a considerable portion of other work in other parts. The contractors named have, the inspection leads one to say, done their respective parts extremely well.

Now for the details. The building consists of one block 277 feet long inside between the gable walls; and it is subdivided by a longitudinal wall separating the coal-stores from the retort-house. The coal-stores are 75 feet wide inside; and from the yard level to the eaves they are 41 feet high. The stores are arranged into nine compartments, with a total capacity for storing 10,000 tons of coal, without trimming. The building is covered by means of an elliptical arched roof in one span; sixteen principals being placed every 16 ft. $3\frac{9}{17}$ in. apart. A deep continuous skylight in the roof at each side of the ridging makes the place beautifully light. The ends of the principals are attached to vertical rolled steel joist stanchions, which are built into the brickwork of the building, and which extend down into the concrete foundations below the footings. The roofs are, excepting where otherwise stated, all slated.

Right through the stores are four roads of overhead railway, of English standard gauge. They are carried by steel girders, with gangways on each side, and are fixed at a height of 23 ft. 3 in. above the yard level. The rails are of single-headed flat bottom type, spiked down to longitudinal oak sleepers, bolted to jaws on the top flange of the girders. The girders rest on stone corbels set in the cross walls dividing the various compartments of the stores. The compartments are isolated from each other as far as possible in case of fire; archway openings only being left in the division walls, so that access can be had to the coal when required. The floor of the coal-store is of cement and shingle concrete 9 inches thick, laid upon a bed of bricks, broken into 3-inch cubes 12 inches in thickness.

The coal required for immediate use is deposited in the central or working bay, so that the shorter distance will be travelled to the crushers. As the trucks containing coal arrive at the sidings after being weighed, they are shunted up the railway approach to the stores by the locomotive engine, which it is noticed in passing bears the name of the Chairman of the Company—Sir John Baker. The inclined embankment to the coal-stores (which as previously mentioned has a rise of 1 in 40) was constructed from materials taken from the excavations. At the south end of the coal-stores, it is pointed out that four brick arches, 78 ft. 6 in. long by 15 ft. span each, have been substituted for the earthwork; these arches being intended for the storage of fire-clay goods.

Turning into the retort-house, it is learned that it is 53 feet wide, and from the yard-level to the eaves, it is 52 feet high. Like the coal-stores, it is covered with an elliptical arched roof. The principals are placed at a similar distance apart; the ends being attached to vertical steel stanchions in a similar manner to those in the stores. There is a deep skylight running the full length of the building; this being placed immediately over the coal storage hoppers. A continuous open top ventilator, 7 feet wide, with steel combings down the centre of the ridging, is also a feature of the roof. The most critical expert will concede that the house is a fine one, and that upon it Mr. Ashworth has devoted the utmost thought to all parts and details. The ample provision in the way of ventilation and light should result in comfortable working when the house is in operation.

The house contains two inclined-retort benches (showing the excellent work of Messrs. Gibbons Bros.), with ten ovens or

FRONT ELEVATION OF THE COMPLETED RETORT-HOUSE AT HILSEA.

arches in each battery. The benches are 17 ft. 2 in. wide and 12 ft. from centre to centre of piers. Each bench rests upon a concrete bed 1 foot thick. To each bed of ten ovens, there is a separate chimney shaft, 100 feet high, erected outside each end of the retort-house. The chimneys are built on concrete beds 13 ft. 9 in. by 15 ft. by 7 ft. thick; and are 12 ft. 3 in. square above the plinth—being surmounted on top with a half-round moulding. Above the base, they are octagonal in shape, measuring 11 feet from face to face, and tapering at the top to 7 feet across. The neckings are panelled out; and the heavy cast-iron cap is filled with brickwork and rendered over. The chimneys are fire-brick lined for a height of 18 feet, one-half brick thick, having a cavity of $2\frac{1}{4}$ inches. The linings are tied to the casings with special made bonding fire-bricks.

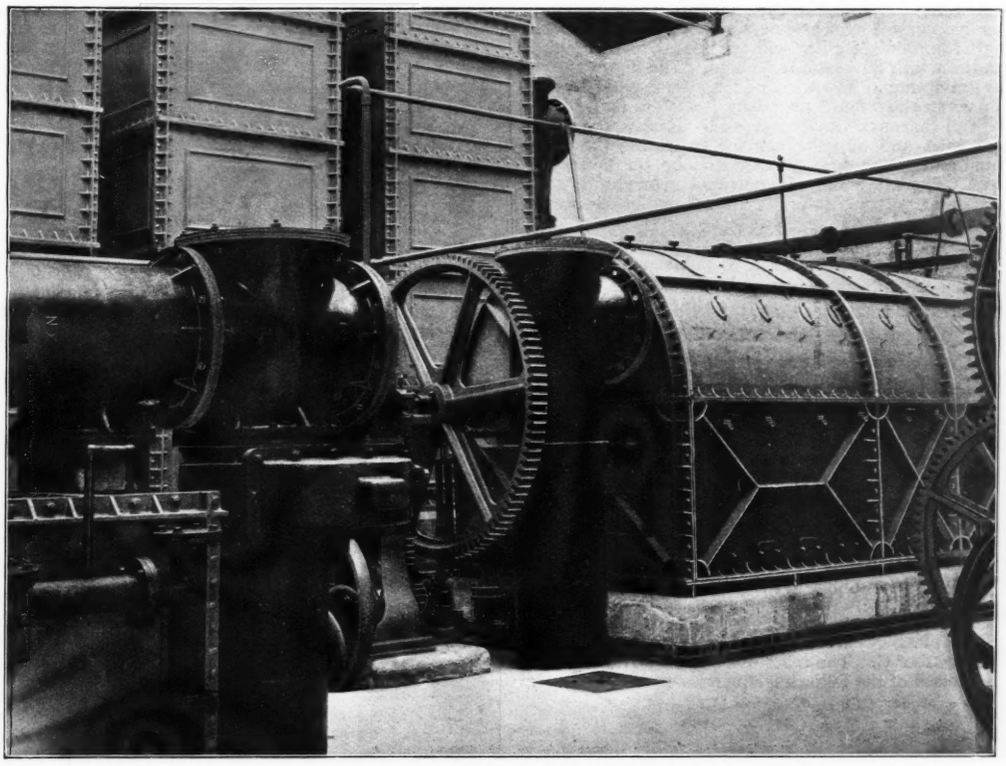
One is always inquisitive to find out why an engineer has adopted a certain system in preference to another; and, upon inquiring of Mr. Ashworth why at Hilsea he has gone over to inclined retorts, he stated that he was largely swayed by the local conditions of the labour market. In winter, in Portsmouth, there is often difficulty in obtaining suitable men to perform the work of charging and drawing; and this is there a strong point in favour of inclines. At present only one-half of the house is fitted up; five of the beds containing nine inclined retorts, and the other five ovens eight. Asked why he had varied the number of retorts in the settings, Mr. Ashworth said he wanted to prove for himself which was the better number; and the other half of the settings would be filled in accordingly. The hydraulic mains on the beds of eights are fitted for nines. The retorts are 20 feet long, measured on the angle, and of ⏢ section 21 in. wide by 16 in. deep at the charging end, tapering to 24 in. wide by 16 in. deep at the discharging end. The retorts are set at an angle of 32°. The settings are built throughout with Stourbridge clay goods with the exception of the parts which are subject to intense heat, where Silica goods have been employed. In passing, it may be observed that six-hour charges will be the rule here; the men working on eight-hour shifts.

The buckstaves and bracings at the back of the settings consist of heavy section rolled steel joists. At the back of each buck-stave, there is a steel breast plate, 12 in. wide by $\frac{5}{8}$ in. thick, attached with counterheaded rivets for clipping the piers of the benches. From the front to the back buckstaves, rolled steel joists span the retort-bench; and there is also a second tier of joists spanning over the charging-floor into the division wall of the retort-house. These are for supporting the hydraulic gas and tar mains, and also the coal-hoppers. The furnace fronts are tied in by stout vertical steel corner angles and horizontal ties of a similar section. The discharging mouthpieces are braced with deep section bulb T bars.

Regarding the hydraulic mains, these are made of mild steel, and are of half-D section. They are in lengths of 23 ft. 9 in. each, and are capable of taking the gas from two settings of retorts. Immediately behind the hydraulic main, there is an 18-inch diameter cast-iron receiving gas-main, connected to the hydraulic mains with gas off-takes and valves. There is also a tar run-off cock to each section, and dip-regulating valves. The dip-pipes are so arranged that there is a minimum seal of 1 inch in the hydraulic mains. The tar-pipes are in double or twin form—one being under gas pressure, sealing in a pot at the end of the retort-bench; the second line of pipes being open to the atmosphere. Into these, the tar is to be run off daily from the bottom of the hydraulic mains. The liquor supply for washing out and maintaining the seal in the hydraulic mains will be supplied by gravitation from the overhead storage tank above the pump-house. The primary condensing gas-main is of mild steel, 24 inches diameter, and runs on the front side of the retort-house, supported by cantilever brackets attached to the stanchions supporting the roof over the retort-house. Messrs. Newton, Chambers, and Co., supplied the ascension-pipes (as well as the gas-valves on the works); while Messrs. Westwood and Wrights furnished the hydraulic and foul mains and the retort mouth-pieces.

The charging and drawing stages are roomy. The former is 23 ft. 3 in. above the basement floor; and the latter is 10 ft. 6 in. above the basement. They consist of a series of cast-iron plates bolted together, resting on rolled steel cross joists and longitudinal steel T bearing-bars between the cross girders. For the protection of the stokers in inclement weather, it is observed that swinging window shutters have been provided upon the drawing-stage. In the centre of the retort-house, between the benches, staircase accommodation is provided for communicating between the basement and drawing-stage, and again in turn to the charging-floor. There are also staircases at each end of the house connecting the charging and drawing stages. There is thus plenty of convenience in this way.

The coal plant next claims attention. The coal and cannel breakers (which are very powerful ones), together with the steam engines and elevators, are in duplicate, and are in the central bay of the coal-stores and retort-house, between the two retort-benches. Each breaker and elevator is capable of dealing with 25 tons of coal and cannel per hour. Arrangements are made for the driving and manipulation with a series of jaw clutches, so that either engine can drive the coal breakers or elevators, at the will of the operator. The breakers are fixed in a pit below the ground floor-level, and are provided with bye-pass shoots and screens, so that all material of less size than will pass through a 2-inch square opening will not go through the coal-breaker jaws. The two steam-engines for driving the coal-handling plant are of 20 brake horse-power, of the Tangye type, and are fixed in an overhead room above the breaker-pit. In their trial working at the time of the visit, they were running beautifully. The engine-room floor consists of an extra strong section of corrugated steel troughing, supported by three main built-plate girders; the valleys of the troughing being filled in with concrete. The engines rest upon stone foundations; the floor being paved with Stafford-



A View in the Condenser-House at Hilsea.

shire blue bricks set on edge. The engine-room is so designed as to be practically dust-proof. The belt chases, too, are covered over with riveted steel hoods and the crank-shafts of the engines pass through stuffing-boxes.

The coal, after being elevated, will be distributed, at will to right or left, through spouts on to the push-plate conveyor, which then delivers the coal into a continuous overhead storage hopper. The hopper is subdivided into ten compartments, and has a storage capacity for twelve hours' requirements. From the hopper the coal will be withdrawn into fixed measuring-chambers, and then into the retorts, by means of portable shoots travelling on overhead rails. Platforms, landings, and staircase accommodation have been provided for the operator for oiling purposes. The measuring-chambers are of the usual type. Vertical shafts, having treble square-threaded screws for quick traversing working in wrought-iron forged nuts, with hand-wheels fixed at the lower ends of the spindles, operate the sliding-doors of these measuring chambers by means of bell-cranked levers and connecting-rods. The rocking shafts are carried by cast-iron brackets attached to a continuous steel motion box. This arrangement substitutes the usual forest of levers employed in similar installations, and will not impede the operations of the men. The whole of the coal plant was supplied by the New Conveyor Company, Limited; and Mr. Ashworth says that they did their utmost to give satisfaction; and in the result they have, it must be acknowledged, made a capital job of the work.

As the coke is discharged from the retorts, it will be conveyed from the retort-house to the coke yard in iron-side tip-waggons running on the 2 ft. 6 in. gauge railway. In the basement of the retort-house, the rails are set flush with the paving, there being an "up" and "down" road with cross-overs. Each tip-waggon is large enough to take the coke from a retort, with charges of 7 cwt. In the yard the narrow-gauge railway is portable, and can be placed at such positions as may be required. The waggons and narrow-gauge railway were supplied by Messrs. F. & J. Howard. The basement floor both at the front and back of the retort-benches are paved with Staffordshire blue bricks set on edge, and resting on a concrete bed 6 inches thick. Here there is a little conversation with Mr. Ashworth on the subject of the relative merits of his system of coke removal and coke-conveyors. He emphatically says that he does not believe in the latter, and thinks that the wear and tear does not pay for the capital outlay. With them, one is, he argues, tied to one position for tipping; whereas with coke-waggons and a portable railway, the coke can be tipped anywhere. He has it in contemplation to adopt small locomotives for drawing the waggons, as is practised at Glasgow.

The Condenser House.

Following the course of the gas from the retort-house, it is learned that it will be conveyed through a 24-inch diameter main to the condenser-house. This building was erected by Mr. John Croad, with, it may be said here, the lime-shed, purifier foundations, and sulphate of ammonia factory. The condenser-house is 56 ft. long by 53 ft. wide, and 25 ft. 9 in. high to the eaves. The roof principals are of steel throughout, and of the ordinary trussed type. The house is covered with a boarded and slated roof, with extra deep continuous skylights on each side of the ridging. There is also a continuous open-sided ventilator having a wrought-steel hood plate over. The flooring is of concrete 6 inches thick, laid on a bed of broken bricks of 3 inches cube, 12 inches thick; the floor being finally rendered over with cement grouting 1 inch thick. The house contains a battery of three tower vertical water-tube condensers by Messrs. Clapham Bros., having steel water tubes 3 inches bore. They are of such capacity and design that they will pass 2,500,000 cubic feet of gas per 24 hours, and reduce the gas from 150° Fahr. at the inlet to 55° Fahr. at the outlet, when cold water is supplied from the overhead tank.

On leaving the condensers, the gas, after passing through the exhausters, returns again to this building, in which there is a tar-extractor of the Livesey type (by Messrs. R. & J. Dempster). This has a capacity of 2,500,000 cubic feet of gas per day. The building also contains two 2½ million cubic feet daily capacity rotary washers of Clapham's "Eclipse" type. It is intended to use the first washer for working up the liquor to a commercial strength; and the second or final machine will be employed in removing the last traces of ammonia from the gas by washing the gas with fresh water. Arrangements have been made whereby the liquor can be pumped over and over again if desired to work up the strength; and one machine will accomplish the washing in case of breakdown with the second machine. The liquor supply is entirely by gravitation. The weak liquor, after leaving the final washer, will pass to the "foul" or "dirty" washer, then to the tar-extractor, and thence to the storage well. Each apparatus is provided with inlet and outlet gauge for indicating the difference of vacuum and pressure, as the case may be, on the respective appliances. The gauges are concentrated on one battery; so that in case of any stoppage in the gas-way, the point of obstruction can be ascertained at one reading.

In the concluding article (which will be published next week), we shall describe and illustrate the plant from the exhausters onward to the gasholder and its tank, the sulphate of ammonia works, and the governor-house, laboratory, and offices.

CONCENTRATION OF ENERGY IN COAL GAS.

In another part of the "Journal" we give an abstract and illustrations of the processes for improving coal and other gases, as set forth in the recent patent specification of Messrs. H. S. Elworthy and S. Williamson. The present proposals are the corollary to those set forth in a previous patent (No. 12,461 of 1902) for a much more restricted scheme. The principle upon which both patents are based is the interaction of carbon monoxide with hydrogen to produce marsh gas when the component gases are heated to the requisite temperature in contact with finely-divided nickel. A similar reaction occurs when carbon dioxide takes the place of carbon monoxide, and the temperature is raised an extra 100° C. The reactions may be advantageously examined by the aid of the following equations:

$$3\ H_2 + CO = CH_4 + H_2O \text{ and}$$
$$4\ H_2 + CO_2 = CH_4 + 2H_2O$$

These reactions are but part of a large number that are now known to be possible in the presence of hydrogen and a suitable catalyst, when hydrocarbons or other compounds of carbon are passed over in vapour at appropriate temperatures.

Paul Sabatier, of Toulouse, with his coadjutors, J. B. Sendersens and Alphonse Mailher, has done valuable work in this direction; but as to the two particular reactions above equated, we believe priority has been proved to exist in favour of Mr. Elworthy. This has been established in the Continental Law Courts, and a scheme for the application of the system to water gas is taking practical shape, under Mr. Elworthy's patents, in the South of France. Experiments are, we believe, being conducted by one Gas Company in this country to ascertain the suitability of the methods as applied to uncarburetted water gas; and the reports from these sources ought to materially help in estimating the value of the enlarged project.

It will be seen at a glance that the proposal involves a considerable diminution in the volume of the gas to be distributed, as three volumes of hydrogen and one volume of carbon monoxide coalesce to form one volume of marsh gas; while with carbon dioxide the concentration is from four volumes of hydrogen and one of carbon oxide to one of marsh gas (CH_4). It is also important to note that while the temperature of the reaction (250° C. and 350° C. respectively) must be maintained, a fraction at least of this heat may be obtained from the conversion, which is exothermic—that is, sensible heat is manifested. But this manifested heat is only obtained by a loss in the total heating power of the gases which remain after the conversion.

Taking the currently accepted heating values of the several gases, it will be seen what this loss amounts to

		B.T.U.	
3 vols. (cubic feet) of hydrogen . .	$= 3 \times 272{\cdot}0 =$	816	net or
		975	gross.
1 vol. ,, carbon monoxide	$= 1 \times 330{\cdot}0 =$	330	net or
		330	gross.
Total heating power of original gases	$= 4 \times 286{\cdot}5 =$	1146	net or
		1305	gross.
,, ,, ,, marsh gas formed	$= 1 \times 919{\cdot}0 =$	919	net or
		1024	gross.
Difference		227	net or
		281	gross.

This reduction is equal to about 20 per cent. On the other hand, a gas of higher calorific and illuminating powers and of less poisonous character is the result. Indeed, it is quite conceivable that when applied to water gas the improved constitution might so diminish the need for oil enrichment or carburetting as to more than compensate for the loss pointed out. Again, the fact that carbon dioxide may be thus rendered harmless might make it commercially possible to produce blue water gas for a longer period of each run. It is such practical questions as these that ought to be determined before any judgment is passed upon the interesting proposals now before us.

There is, however, a limitation in uncarburetted water gas that must not be overlooked, and that is the relative volumes of hydrogen and carbon monoxide present. This is approximately equality of volume, whereas the formation of methane requires three volumes of the former to one of the latter. It is at this juncture that the significance of the proposals of the 1905 patent are apparent. In coal gas there is usually more than enough free hydrogen to serve for the conversion of both the oxides of carbon into methane. The following figures represent approximately the volume of each gas usually present in coal gas:—

Hydrogen.	45	
Carbon monoxide	8	
Carbon dioxide	3	maximum in unpurified gas.
Marsh gas	35	
Heavy hydrocarbons	6	
Nitrogen, &c.	3	
	100	

To convert the carbon monoxide would require $8 \times 3 = 24$ volumes of hydrogen; to convert the carbon dioxide, $3 \times 4 = 12$ volumes—total 36 volumes, thus leaving 9 volumes to spare. If water gas be added to the coal gas, so as to provide theoretical conditions for the conversion of the oxides of carbon into marsh gas, the mixtures would be as follows:—

Gaseous Component.	A. Coal Gas.	B. Water Gas Added when CO Converted.	Mixed Gases A + B.	After Conversion of A + B.	C. Water Gas Added when CO + CO_2 Converted.	Mixed Gases. A + C.	After Conversion of A + C.
H_2 . . .	45	10·5	55·5	nil	4·5	49·5	nil
CO . . .	8	10·5	18·5	nil	4·5	12·5	nil
CO_2 . . .	3	..	3·0	3·0	..	3·0	nil
CH_4 . . .	35	..	35·0	18·5 / 35·0	..	35·0	15·5 / 35·0
C_nH_m . .	6	..	6·0	6·0	..	6·0	6·0
N_2 . . .	3	..	3·0	3·0	..	3·0	3·0
Total vol. .	100	21·0	121·0	65·5	9·0	109·0	59·5

Thus where only carbon monoxide was to be converted, 21 volumes of water gas could be added to 100 volumes of coal gas—the 121 volumes of the mixture becoming, after the conversion, concentrated in 65·5 volumes; and where the carbon dioxide also was converted, 9 volumes of water gas could be so added with a shrinkage of volume by the process of from 109 to 59·5 volumes. Taking the calorific powers, the result would be as follows:—

Component.	Before Conversion.	B.T.U. Net.	After Conversion of CO.	After Conversion of CO + CO_2.
H_2	45 × 272	= 12,240	..	..
CO	8 × 330	= 2,640	..	..
CO_2	3 × nil	..	3·0	..
CH_4	35 × 919	= 32,165	53·5 = 49,166	50·5 = 46,410
C_nHm	6 × 1800	= 10,800	6·0 = 10,800	6·0 = 10,800
N_2	3 × nil	..	3·0	3·0
	100	= 57,845	65·5 = 59,966	59·5 = 57,210
Net B.T.U. per cubic foot.		578	915	961

That is, a gas originally possessing a net calorific power of 578 B.T.U. per cubic foot would be raised by the conversion of its hydrogen and carbon monoxide into one of 915 B.T.U.; and by extending the conversion to the carbon dioxide, it would be raised still further to 961 B.T.U. The gas would, excluding the nitrogen, be wholly composed of hydrocarbons of a highly valuable character. Does, then, the patented proposal offer a prospect of commercial success? One condition anticipated by the inventors is the removal, temporarily or otherwise, of the heavy hydrocarbons. If permanently removed, what is to be the source of income to

compensate for their loss? and if only temporarily, what is to be the cost of their extraction and return?

Much could be said upon the schemes in their various degrees of elaboration; but a practical trial, even upon a small scale, would furnish a better clue as to their industrial value than any criticism without such aid. The inventors are to be congratulated upon their clear understanding of the scientific principles involved; and it is to be hoped they will meet with the encouragement and reward their efforts deserve.

GAS-ENGINE ACCIDENTS.

It has become quite a hackneyed saying that failures are more instructive than successes. Something of this kind constitutes the opening lines of the report for 1904 of the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited (Mr. Michael Longridge, M.A., M.Inst.C.E.); and, applying the statement to this report, we may say that, like its predecessors, it is found instructive in a high degree, for it is filled with descriptions of breakdowns, explosions, and mishaps—failures every one. The report is, as usual, divided into sections; but our concern centres in the section which includes gas and oil engines.

It is, in the first place, of interest to turn to the section of the report in which are noted the proportions in which the various parts of the insured engines which broke down in 1904 caused or initiated the breakdowns. But we do wish, in giving these figures, that we could prevail upon Mr. Longridge to distinguish between the gas and the oil engines; for the percentage figures which follow refer to both types of engine. However, the figures are in some measure gauges of the risk attaching to each of the several parts, and of the attention they ought to receive. The percentages of breakdowns resulting from the failure of the parts mentioned are: Valves and valve gear, 31·3; cylinders and cylinder ends, 14·8; main-shafts, 10·9; connecting-rods, caps, and bolts, 10·2; governors and governor gear, 10·2; fly-wheels and their keys, 8·6; silencing boxes and exhaust-pipes, 6·3; bed-plates and pedestals, 3·1; pistons, 3·1; and crosshead centres in pistons, 1·5. The figures, it will be noticed, are given in the order of their numerical importance. The causes of these breakdowns may be roughly classified as follows: 31 per cent. were due to accidents or causes unascertained; 22 per cent., to the negligence of owners or attendants; 22 per cent., to old defects and wear; and 25 per cent. to weakness, faulty design, or bad workmanship. The number of the breakdowns due to the last-named causes is always regarded by us with a great deal of regret.

It appears that the rate of breakdown among the gas-engines has been but little lower than among steam-engines, although the working parts are less. A great number of the breakdowns have been due to breakages of small parts of the valve-gears; and, among this class, breakages of the helical wheels driving the side shafts have been sufficiently numerous to attract particular attention. A case in point given by Mr. Longridge is a horizontal gas-engine (cylinder, 17 inches diameter and 26-inch stroke), running at 150 revolutions per minute. The helical wheels driving the horizontal side shaft carrying the cams for working the valves were broken. The cause was insufficient lubrication of the bearing at the cylinder end of the shaft. There have been many similar breakages from the same cause where lubrication has depended upon the oil-can; and they point strongly to the need of a more general adoption of the simple and efficient system of ring-oilers for these shafts.

The more serious breakdowns have been caused principally by breakages of crank-shafts, connecting-rod bolts, fly-wheels, and cylinder ends. Of the gas-engine crank-shafts broken during the year, 8 per cent. had four bearings and two fly-wheels, and broke at the crank-pin. Thirty-one per cent. had three bearings. Of these, 25 per cent. broke at the bearing between the crank and the fly-weeel, and 25 per cent. through the crank web next the fly-wheel. Thirty-eight per cent. had two bearings, and two fly-wheels. Of these, 60 per cent. broke through the crank-pin, and 40 per cent. through the bearings between the crank and one of the fly-wheels. Twenty-three per cent. had two bearings and one fly-wheel, all of which broke in the bearing between the crank and one of the fly-wheels.

In one case—that of a small engine with cylinders 5 inches diameter by 9-inch stroke, running at 230 revolutions per minute—the crank-pin was unsound. The shaft was made of an iron bar 2 inches diameter bent to shape. The crank-pin was $1\frac{7}{8}$ inches diameter. It fractured at one end. The fractured surfaces showed a ring of newly-broken metal from $\frac{1}{16}$ to $\frac{1}{8}$ inch wide all round the circumference, with an old flaw looking like an imperfect weld about $1\frac{1}{16}$ inches diameter in the centre. Take another illustration—a horizontal gas-engine, nine years old, running on town gas. It has a cylinder 18 inches diameter by 24-inch stroke; and the speed is 130 revolutions per minute. The shaft, which had four bearings and two fly-wheels, broke through the crank-pin. The pin was $6\frac{1}{2}$ inches diameter by 8 inches long; the bearings on each side of the crank were $6\frac{1}{2}$ inches diameter and 12 inches long, and the distance between their centres 35 inches. The initial pressure on the piston was 350 lbs. per square inch, of which about 40 lbs. per square inch would be required to impart velocity to the moving parts, leaving about 310 lbs. per square inch of piston area, or 79,000 lbs. as the load upon the crank-pin at the beginning of the stroke. Taking the shaft as a beam $6\frac{1}{2}$ inches diameter and 35 inches long, loaded in the middle with 79,000 lbs., the stress at the middle of the pin would be 25,000 lbs. per square inch; while, if the length of the beam be assumed to be only 23 inches—the distance between the inner ends of the bearings—the stress would be 16,500 lbs. per square inch. Besides this, the pin at the beginning of the stroke had to bear part of the stress exerted by the fly-wheel on the side of the crank remote from the belt driven, for this wheel is then driving part of the load.

The stresses on the shafts of gas-engines are not, it is pointed out by Mr. Longridge, easily amenable to calculation, especially where there are more than two bearings. But even when there are only two, the calculations are laborious and generally imperfect owing to lack of data; for the stresses are modified by the tension of the driving-belt—generally an unknown quantity—and the direction of its pull being greater when the driven drum is behind than when it is in front of the cylinder. They are also modified by the number of fly-wheels (being less with two than with one) and by the position of the heavier sides of the wheels relatively to the cranks if the wheels are out of balance—weights opposite the cranks increasing the stresses on the crank-pins. If imperfect theoretical knowledge is responsible for the great differences of opinion which exist as to the proper proportions for these shafts, it is certain that practical experience has condemned the proportions commonly adopted some years ago. Latterly, these have been considerably increased; but it is doubtful if they are yet generally sufficient.

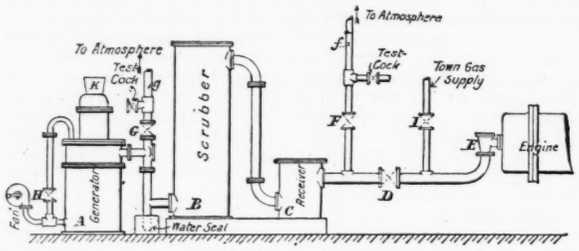
A further illustration of accident has reference to a horizontal single-cylinder gas-engine (six years old), supplied with Dowson gas. The cylinders are $11\frac{1}{2}$ inches diameter by 18-inch stroke; and the speed is 180 revolutions per minute. The big end of the connecting-rod was of the marine type, with a cap secured by two $\frac{7}{8}$-inch steel bolts, screwed with Whitworth threads, nuts, and lock-nuts. One of these bolts broke at the root of the screw-thread. The cap was torn off, the other bolt and the rod were bent, and the piston, cylinder liner, and bed-plate broken. The cause of the breakage was, Mr. Longridge reports, probably repeated blows owing to slackness of the big end brasses, for the Inspector in whose district the engine was, was constantly complaining about it. During the explosion and compression strokes, there is no stress on the connecting-rod bolts of a single-acting gas-engine, as the rod is in compression, but at the end of the exhaust stroke, the force required to arrest the piston and connecting-rod is furnished by the fly-wheel, and so the rod and its bolts are in tension. Also at the beginning of the admission or suction stroke, the force required to overcome the inertia of the moving parts, and start them on their outward course, as well as the power required to produce the partial vacuum in the cylinder, is furnished by the fly-wheel, and transmitted by the bolts in tension. In the case of the engine just referred to, these forces probably, the reporter calculates, put a load of about 6000 lbs. upon the two bolts, causing a tensile stress of 7100 lbs. per square inch upon the cores of the screw-threads. It is not surprising that a screw-thread exposed to many sudden repetitions of such a stress, should break. But it is not only to tensile stresses that the connecting-rod bolts of some gas-engines are exposed. They have sometimes to resist bending stresses also, which are much more fatal to pieces with abrupt changes of sectional area or screw-threads, than merely direct pulls. Sometimes the brasses of the big ends of gas-engine connecting-rods are planed flat across the backs, which fit against the butt ends of the rods and caps. They are not counterchecked into the butts or caps or into each other, but are kept in alignment only by the bolts and crank-pin, or, if they are slack upon the crank-pin, only by the bolts. The bolts in the case of a horizontal engine lie approximately horizontally. The big end of the connecting-rod moves up and down as well as to and fro. The force that moves it up and down is transmitted from the crank-pin to the brasses, from the brasses through the bolts to the butt end and cap. This force is approximately at right angles to the axes of the bolts, and therefore exerts either a shearing or a bending stress upon them, depending on the fitting of the parts. Having regard to the number of breakages of connecting-rod bolts, it is suggested by Mr. Longridge that 7000 lbs. per square inch (which seems to be about the usual stress allotted to them) is too high. Moreover, it must always be remembered that very high stresses may come upon these bolts from undue friction between the piston and the cylinder liner.

Another accident claims comment. This is the case of a horizontal gas-engine (seven years old). The cylinder is 10 inches diameter by 18-inch stroke; and the speed is 180 revolutions per minute. The cranked shaft was 4 inches diameter, and carried a fly-wheel 5 ft. 8 in. diameter on one end secured by a single key. The fly-wheel boss, which was 8 inches diameter without hoops, split from the keyway, and the wheel flew in pieces. On examination, after the breakdown, the diameter of the shaft was found to be nearly $\frac{1}{32}$ inch less than that of the hole in the boss; and the surface was worn away by the wheel rubbing upon it. Evidently the key, which was also marked by some wear, had been insufficient to hold the wheel. This is a typical case. The bosses of gas-engine fly-wheels are frequently far from fitting tightly upon the shafts. Indeed, Mr. Longridge finds it difficult to see how they can be fitted very tightly, for after having been put on in the maker's shop they have generally

to be taken off again and then refitted at the purchaser's works without hydraulic presses or any special appliance for making a tight fit. In many cases, therefore, they depend entirely upon one small key, which has insufficient bearing surface on the shaft or in the wheel to hold the latter firmly under the severe conditions to which gas-engine fly-wheels are exposed. It would cost little, and add greatly to the security of these wheels, if the bosses were split bored to fit tightly on to the shafts, and secured by the contraction of steel hoops put on hot.

Cracking of the cylinder ends of gas-engines, it is remarked, is a source of great annoyance and of much expense. These cracks sometimes disable the engine suddenly, but generally they are insignificant when first seen, and then gradually extend till they necessitate replacement of the end. In some districts they are caused by accumulations of deposit in the water-jackets; but this difficulty is now being lessened by the provision of facilities for cleaning the internal surfaces. In most cases, however, they are caused by unequal expansion of the parts subjected to the heat of the burning gas, and the larger engines are affected much more seriously than the smaller. Considerable improvements have been made within the last two or three years by some of the gas-engine makers; and no doubt in time the gas-engine will become a serviceable motor for large powers. Efforts are being made to reduce the internal temperature by increasing the supply of air and by injecting water. Mr. Longridge's opinion, however, is that the successful gas-engine of the future is likely to be constructed on the lines of the Diesel oil-engine, notwithstanding the difficulty of safely and efficiently compressing the gas to the pressure required to obtain spontaneous ignition.

As a conclusion to the gas and oil engine section of the report, the following description of an explosion of part of a suction gas-generating plant is given by Mr. Longridge. It only occurred this year; but "the circumstances which led to it might as easily be reproduced, and the consequences of a similar explosion might be so disastrous, that it seems unfair to keep back the particulars till the report for 1905 is written." The arrangement of the plant is shown diagrammatically; and the following is the accompanying



statement: On the morning of the explosion, the plant was working under normal conditions—that is to say, the cocks H, G, F, and I were shut, and the valves D and E were open. At 10 a.m. the engine was stopped on account of a hot bearing. The valves E and D were closed; and the cocks F and G were opened to allow the gas to escape into the air. The heated brass was taken out, cooled, scraped, and refitted by 11.45. The cock I was then open to admit town gas for starting the engine; but owing to some defect in the magneto-ignition apparatus, the charge could not be fired. About twenty minutes were spent in trying to get a start, when at 12.5 the receiver—a vessel about 4 feet diameter by 6 feet long, exploded with great violence, but fortunately without any injury to the men in the engine-room close by. The cause of the explosion was the opening of the cock F. During the two hours which elapsed between the opening of the cocks G and F at 10 a.m. and the explosion, the apparatus was under the same condition as to ventilation as a coal mine having an upcast shaft *g* with a furnace at the bottom to produce a draught and a downcast shaft *f* to supply fresh air. The air so supplied, of course, rendered the gas with which it mixed explosive; and as soon as the explosive mixture reached the junction of the pipe *g* and the generator, it ignited. The flame travelled backwards through the scrubber to the receiver, which at once exploded. It is probable that the propagation of the flame through the scrubber was sufficiently retarded by the mass of cold, wet coke contained therein to prevent any explosion there. Moreover, the gas in the receiver was probably richer than that in the scrubber, owing to leakage of town gas through the valve D, for this valve was a sluice-valve, and, like any other similarly situated valve would be, was not gas-tight, and the town gas, of course, was under pressure. The leakage, however, would not have been a source of danger if the cock F had been kept shut, for then the air required to make the gas explosive could not have got into the receiver. For so short a stoppage, it was unnecessary to open the cock F. This cock should only be used when starting the apparatus after a stoppage long enough to arrest the production of gas in the generator; and then it should only be opened after G has been closed.

To start the apparatus after such a stoppage, the cock H must be opened, and the fan started and kept running till the gas can be ignited at the test-cock on the pipe *g*. The cock G must then be shut, and the cock F opened, and the fan still kept going until gas can be ignited at the test-cock on *f*. This cock and the cock F must then be shut, and the stop-cock at the engine opened, still keeping the fan going. The engine should then be started; and when it has made two or three revolutions, the fan should be stopped and the cock H closed. The cocks F and G should, it is pointed out, never be opened at the same time; and this last condition would be more likely to be effectively observed, if the waste-pipe *f* were placed between the engine stop-cock E and the cylinder with the cock F close to the cock E, as the attendant, being obliged to shut E, in order to stop his engine, would thereby shut off the communication between the waste-pipe *f* and the receiver, and thus prevent air entering the receiver through F, even if F was opened before G was closed. Mr. Longridge also thinks it would be well to have a two-way cock, instead of a plain cock at G to put the generator in communication either with the outside air or with the scrubber, and to prevent communication between the scrubber and the outside air. While the simple cock is open, there is communication between the receiver, the scrubber, and the outside air; and if the apparatus be left standing with the cock open, the air, as soon as the generator has got cool, can pass down the pipe *g*, and mix (after the manner of gases) with the contents of the scrubber and receiver. At some stage, the mixture will become explosive; and, if the generator were re-started at this critical stage, an explosion might result.

THE CONCILIATION (TRADE DISPUTES) ACT.

THERE has lately been issued the fifth report by the Board of Trade of proceedings under the Conciliation (Trade Disputes) Act, 1896, which covers the two years from July 1, 1903, to June 30 last; but as these documents are issued at such long intervals—the immediately preceding one was noticed in the "JOURNAL" for Dec. 15, 1903—it may be well, before dealing with the figures now published, to briefly recapitulate the main provisions of the Act in question. As is indicated by the title, the object is, of course, the prevention and settlement of trade disputes. The first section provides for the registration of Conciliation Boards, who have to furnish the Board of Trade with such returns, reports of proceedings, and other documents, as may be required; while the next section enumerates various powers which may be exercised by the Board of Trade where a difference exists, or is apprehended between employers and workmen or between different classes of workmen. Under these powers, the Board of Trade may: (1) Inquire into the causes and circumstances of the difference; (2) take such steps as may seem expedient for enabling the parties to the difference to meet together, by themselves or their representatives, under the presidency of a chairman mutually agreed upon or nominated by the Board of Trade or by some other person or body, with a view to the amicable settlement of the difference; (3) on the application of employers or workmen interested, and after taking into consideration the existence and adequacy of means available for conciliation in the district or trade and the circumstances of the case, appoint a person or persons to act as Conciliator or as a Board of Conciliation; (4) on the application of both parties to the difference, appoint an Arbitrator. If it appears to the Board of Trade that in any district or trade adequate means do not exist for having disputes submitted to a Conciliation Board for the district or trade, they may appoint any person or persons to inquire into the conditions of the district or trade, or to confer with the employers and employed, and (if the Board of Trade think fit) with any local authority or body, as to the expediency of establishing a Conciliation Board for the district or trade.

It may be pointed out that the present Blue-book does not deal with the work of the registered and unregistered Conciliation Boards, whose proceedings are included in the annual report on strikes and lock-outs prepared by Mr. A. Wilson Fox, of the Labour Department of the Board of Trade. The issue of that report for 1904, which was noticed in the "JOURNAL" for Aug. 22 last (p. 490), showed that the various Boards of Conciliation and Arbitration were known to have settled 615 cases during the year. The report now under notice (which is by Mr. H. Llewellyn Smith, of the Commercial, Labour, and Statistical Department of the Board of Trade) refers only to the cases in which the Board of Trade took action, either upon their own initiative or upon the application of one or both sides interested in disputes. It must not therefore be taken that the figures to be quoted here give an indication of all that is being done in the direction of conciliation in labour disputes. If that were so, the fact that the number of cases dealt with in the two years covered by the present report (27) shows a considerable falling off as compared with the previous two years, might be taken as proof that there was now a lesser tendency than formerly on the part of masters and men to settle outstanding questions in a friendly manner. In view of Mr. Fox's report, just referred to, this would clearly be an erroneous conclusion to arrive at, because he stated that the number of disputes settled by conciliation in 1904 differed but little from the two previous years. Under these circumstances, it seems fair to assume that the smaller number of the cases with which the Board of Trade had to deal in the period covered by the Blue-book now before us was mainly owing to the fact that the contending parties proved themselves better able than before to straighten out their differences without an appeal to the Board under the provisions above quoted of the Conciliation (Trade Disputes) Act, 1896.

As already mentioned, the number of cases dealt with in the two years covered by the present report was 27, in 11 of which there was a stoppage of work; while the total number of cases dealt with under the Act in the period that has elapsed since it was passed (nearly nine years) is 181. In the majority of the instances now reported, the parties, having agreed to refer the matters in dispute to arbitration, applied to the Board of Trade to appoint an Arbitrator. In no less than 23 out of the total of 27 cases the application to the Board was made on behalf of both parties to the dispute; while in two of these instances the trouble related to the demarcation of work between different trades, and the applications were made by the Unions affected. Three of the applications were received from Conciliation Boards; and another was made by four Arbitrators (two appointed by each side) who had failed to agree. The building trade, which is frequently prolific of disputes, was responsible for 12 out of the 27 cases; and, indeed, during the whole period since the passing of the Act, more than one-third of the total number of cases dealt with have related to this branch of industry. The number of cases settled under the Act in the period reviewed was 23. Of the remaining four, one was pending at the date of the report; in one the action taken did not directly lead to a settlement, the cause of dispute practically ceasing to exist; and in two the Board of Trade were of opinion that action could not usefully be taken, and declined the application. The usefulness of the Act is demonstrated by the fact that altogether 122 of the 181 cases that have arisen have been settled under it; while 14 others were settled by the parties themselves during the negotiations. In 20 of the cases during the past two years, the matters in dispute were settled by Arbitrators or Umpires appointed under the Act; and of these the most important was the dispute in the tin plate trade of South Wales and Monmouth, which involved a stoppage of work by 14,000 persons. Three cases were settled by conciliation; and one of these affected 400 quarrymen in Leicestershire, and involved a stoppage for seven weeks. In other instances also large numbers of workpeople were concerned.

With reference to the work that has been accomplished under the Act, it is pointed out that the rules of Conciliation Boards and other agreements between employers and employed contain in many cases a provision that, in the event of the Board or other conciliatory agency failing to effect a settlement, application shall be made to the Board of Trade for the appointment of an Arbitrator or Conciliator; and clauses of this kind it is urged afford a useful means of avoiding a deadlock. Such provisions have, so far as is known, been adopted in seven cases since the issue of the previous report; making a total of 48 agreements between employers and workpeople in which clauses of this character are known to be included. The parties to one of these agreements are the Gas and Electric Light Fittings Employers' Association, of Birmingham, and the National Society of Amalgamated Brass-Workers.

PROPOSED NEW WATER REGULATIONS.

It will doubtless be in the recollection of those of our readers who are concerned with water supply, that about two years ago a conference was held at the Guildhall, between the Plumbers' Company, the Royal Institute of British Architects, and representatives of some of the larger water undertakings in the country, with reference to the waste of water in domestic use, the efficiency of plumbing work in connection with the public supply of water, and the registration of plumbers. The subject being one in which the British Association of Water-Works Engineers was specially interested, the Secretary (Mr. Percy Griffith, M.Inst.C.E., F.G.S.) attended to represent that body. The outcome of the proceedings was a decision to form a Committee to consider the question of adopting a new set of regulations and standard fittings for water supply. Shortly after the conference, Mr. Griffith had an interview with the Clerk to the Plumbers' Company (Mr. W. R. E. Coles), who expressed the great satisfaction of the Company at the intervention of the Association in the matter. Mr. Griffith's action received the approval of the members at their winter meeting the following month; and he and Mr. Palmer, of Hastings, were appointed the representatives of the Association upon the General Committee. Early in the new year the Committee had a meeting at which Mr. Coles was able to report that he had collected a large amount of information—unique in its fulness and authoritative character—bearing upon the subjects to be dealt with. He was also in a position to state that both the Board of Trade and the Local Government Board were disposed to take full advantage of the work of the Committee in bringing about better regulations, and would permit a reference to them of points of detail. At this meeting, Dr. R. Crawford, of Glasgow, was appointed Chairman of the Committee, and Mr. Coles and Mr. Griffith the Secretary and Assistant-Secretary respectively; and various Sub-Committees were nominated to take up the subjects of bye-laws and regulations, fittings and materials, and workmanship. The work was now well in hand; and the result of the Sub-Committees' labours has lately been presented at a meeting of the General Committee, a report of the proceedings at which will be found in another column.

It will be seen that much of the information obtained related to the varying rate of consumption of water in different towns, and to the want of uniformity in the prevailing practice of water undertakings; regulations drawn up under various enactments presenting, when looked at collectively, an almost entire absence of plan. Closer examination, however, showed that this did not imply want of purpose on the part of individual authorities, but very clearly indicated the extent of the difficulties with which the general body had had to contend, and furnished evidence of the existence of a need for some extended powers to make bye-laws for defined purposes, or for such amendment of the powers possessed by the Local Government Board as would provide for the recognition of such common standards of practice as would represent "an irreducible minimum of efficiency and convenience." One Sub-Committee attempted to codify the chief administrative provisions relating to the distribution of water for domestic and other purposes, and to set up a standard of practice below which no work should be permitted, in the common interests of the water authorities and the public; while another took in hand the subject of the standardization of water-fittings, being very materially assisted in their investigations by the manufacturers. They carefully refrained from attempting to standardize articles which have been under the consideration of the Engineering Standards Committee, and adopted the findings of that Committee with regard to pipes, tubes, and threads. The principal result of the meeting was the approval of a draft code of regulations to be observed by consumers, with schedules of technical details for the guidance of plumbers and others carrying out the work. This was to be submitted to the Local Government Board for consideration, with a view to its general adoption.

The report, of which the foregoing are the chief features, bears evidence that the Sub-Committees have not lost any time since their appointment; and it is to be hoped that good results may accrue from their labours and from the action taken by the Plumbers' Company in initiating the conference. The necessity for adequate regulations for preventing waste of water through imperfect fittings or defective plumbing was fully recognized by the Royal Commission on the Metropolitan Water Supply presided over by Lord Llandaff, as testified by their final report, presented towards the close of 1899. But when, acting upon the suggestions of the Commissioners, the Water Companies submitted to the Local Government Board a revised set of regulations, they were regarded as "demented," and their proposals were received with a perfect howl of indignation. They were accused of bringing forward a clumsy scheme for enhancing the value of their properties at the expense of the ratepayers, in view of the probable formation of a public body to acquire the waterworks and control the supply. The result was that when the public inquiry into the matter was held, under the presidency of Mr. Charles Perrin, the Water Examiner under the Metropolis Water Act, 1871, early in 1901, the opposition to the regulations was so formidable that, after an unsuccessful attempt at their revision, they were withdrawn. This was a regrettable ending to what was really a praiseworthy attempt to substitute a well-considered set of rules for what were characterized as the "emasculated regulations," framed in 1872, which usually found favour with the Local Government Board. It is to be hoped that those now submitted to that body will be more favourably received. Whoever controls the supply of water—whether company or local authority—has an interest in ensuring efficient work in every department of distribution, in order that the valuable fluid, procured at so much expense, shall not reach the consumers in an impure condition, or be wasted by them when they get it.

In connection with this movement, it is gratifying to notice, as pointed out in the report, a cordial "spirit of co-operation on the part of the several interests represented by the Committee." Not only have the suppliers of water taken part in the deliberations which have resulted in the report under notice, but likewise the manufacturers of water-fittings all over the kingdom. Moreover, the Royal Institute of British Architects have welcomed, as was testified by Mr. Searles-Wood at the recent meeting, the opportunity of taking part in the framing of regulations which are more equitable to the consumer, and more efficient from the point of view of the water authorities, than those at present in force. Reference has already been made to the cordial support given to the scheme by the British Association of Water-Works Engineers, and to the recognition of the value of this support by the appointment of Mr. Percy Griffith, the Secretary, as Assistant-Secretary of the Committee. Being a water engineer in actual practice, he was specially qualified to give valuable advice and assistance in the drafting of the new regulations; while his acquaintance with the general law relating to water supply would ensure that they conformed to legislative enactments. All things considered, therefore, they go before the Local Government Board with good prospect of acceptance. How they will be regarded by the consumers remains to be seen.

Copper as a Germicide.—Recent issues of the "Chemical News" have contained a reprint, from the "American Journal of Pharmacy," of an article by Mr. Henry Kraemer dealing with the use of copper in destroying typhoid organisms, and the effect of copper on man. He comes to the conclusion that typhoid organisms in water are eliminated by filtration, boiling, and certain biochemical methods; and of the latter, the use of copper, as proposed by Moore and Kellermann, is probably the most efficient, and at the same time the most practicable.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 53.)

BUSINESS last week on the Stock Exchange was subject to influences which exercised an unfavourable action. It was account week, with a heavy settlement to get through, for one thing; then various rumours of a disquieting nature were started. But the chief factor which controlled the situation was the Money Market. Movements were at times mysterious, and the uncertainty as to what would be the next was very perturbing; so that when at length on Thursday the worst was known, it came almost as a relief. Prices, of course, have suffered a set back, but not to any considerable extent. The Money Market was very active at the end of the quarter. The 3 per cent. Bank-rate fixed on the 7th of September lasted three weeks; and on the 28th, the rate was raised to 4 per cent. Business in the Gas Market was only moderately active; but it was pretty well distributed among issues in general, and not confined to a few of the big ones. The tendency of prices was good and firm, and several quotations made a moderate advance. In Gaslight and Coke issues, the ordinary was quieter than usual, and in mid-week the price was only 99; but this recovered later, and the last dealings were at 99½. In the secured issues, a small amount of maximum done free at 91½ had a lowering effect, but subsequent bargains were at 92½. The preference changed hands at 110½ and 112; and the debenture at 89¾. South Metropolitan was almost wholly overlooked; the sum total being one bargain in the ordinary at 133, and one in the debenture at 89¾. Commercials also were very quiet. The 4 per cent. marked 118; the 3½ per cent. 113½; and the debenture 88. The latter debenture stock still lags in the rear of the like issues of the other two Metropolitan Companies. The Suburban and Provincial group exhibited their usual inactivity. Alliance 7 per cent. marked 15⅛, Bournemouth "B" 17¼, and Bromley "A" 121. Alliance 10 per cent. was quoted at an advance. On the local Exchange, Liverpool "A" gained two points; but there was a fall in Lea Bridge. The Continental Companies contributed a fair proportion of the business done. Imperial gained a point, with transactions rising from 219½ to 221½. Union also advanced another point, changing hands at from 120 to 120¾. European was not dealt in; Tuscan marked 10 and 10⅓. Among the undertakings in the remoter world, Bombay had a rise, marking from 6 15/16 to 7 1/16, Oriental was done at 147⅞, and Hong Kong at 20 and 20 1/16. Cape Town marked 17⅜ *cum. div.*, and ditto debenture stock 102½. Buenos Ayres was done at 12⅝ and 13¼, and ditto debenture stock at 97⅞. River Plate was active at from 13¼ to 13⅝, and ditto debenture stock marked 97½ and 98⅛. Primitiva ordinary improved, and changed hands at from 6 1/16 to 7, ditto preference at from 5 5/16 to 5½, and ditto debenture at 97½. Monte Video was done at 12⅜ and 12½, and Melbourne 4½ per cent. at 103½.

The closing prices are shown in our Stock and Share List on page 53.

The Jäger Purifier System.

Jäger grids are now becoming a familiar feature in connection with gas purifiers in English works; and although it is only eighteen months ago since Messrs. S. Cutler and Sons introduced the system into this country, we understand that it has already been adopted for upwards of 70 purifiers, and among the orders the firm now have in hand are installations for the South Metropolitan Gas Company and the Liverpool United Gas Company. They are also carrying out extensions of the system at Brentford and Leamington, which is further evidence that its advantages and economy are becoming more and more acknowledged. Several of the principal new gas-works built this year—for instance, the Poole works of the Bournemouth Gas and Water Company, the Foleshill works of the Coventry Corporation, and the Winnal works of the Winchester Gas and Water Company—have been provided with purifiers on this system.

North of England Gas Managers' Association.—We have received from the Hon. Secretary of the Association (Mr. Herbert Lees, of Hexham) the programme of the 57th half-yearly meeting, which will be held next Saturday in the De Grey Rooms, York, under the presidency of Mr. Matthew Leaf, the Engineer, Manager, and Secretary of the York United Gas Company. The items upon the *agenda* are substantially as indicated in the "JOURNAL" for the 19th ult.

The Destruction in the Baku Oil-Fields.—A message from St. Petersburg says that a telegram from a representative of the Minister of Finance, who was instructed to go to Baku to investigate the damage by the recent fires in the oil region, states that no less than 1775 petroleum wells were destroyed in Balakhani, Sabunchi, Romani, Bibi-Eibat, and Zabrat—viz., 910 that were in action, 366 that were being bored or repaired, and 499 that were inactive. The number of wells remaining is 1219, of which 525 are active, 282 being bored or repaired, and 412 inactive. The wells in Romani and Bibi-Eibat have suffered least of all; 55 per cent. being intact in Romani and 40 per cent. in Bibi-Eibat. This, it is said, is a considerable advantage for the future of the oil industry; for these are two comparatively young sections, where the oil-wells, though not very numerous, are productive to a generous degree.

AN INTERESTING DAY-SCHOOL EXPERIMENT.

By J. H. BREARLEY, of Longwood.

Some time ago, the master of an elementary school asked me if the boys in his top class might be allowed to look through the gas-works, and have the process of gas making explained to them in a simple way. There was nothing novel in this request. Not only day-school boys, but all manner of guilds and societies, have deemed gas-works of more than ordinary interest, as doubtless every manager of medium or large-sized works is aware. There seemed, however, to be something in the idea capable of useful—indeed, valuable—development.

Quite a revolution has come over methods of teaching in recent years. It has been found that personal observation produces a far more lasting impression upon the memory than a mere description in the cold type of a school reading-book; and hence, wherever possible, models, or failing these charts, &c., are pressed into service for demonstration purposes. Yet even models or charts do not instruct so lucidly as the things they are intended to represent. To a boy, the model of a retort-bench, for example, would never become much more than a beautiful toy. Take him into the retort-house, however, and the process of carbonizing coal becomes a living reality. Why not, therefore, evolve a scheme whereby every elementary school boy may be assured of visiting the gas-works (and, parenthetically, any other works within easy access) at least once in his school career?

This was the thought that continued to revolve in my mind until, with the courteous assistance of Mr. R. A. D. Lyddon, the master of one of the day schools at Longwood, the thought was reduced to a system. It was decided that, in the event of such a scheme being adopted, prizes awarded for the best essays would add considerable interest, and would be an incentive to the boys to use their eyes and ears to the best of their ability while in the works. The scheme drawn up was as follows:—

Scholars' Visit to Gas-Works.

1.—Visits to be confined to two top standards in each school.
2.—Time to visit to be arranged to suit the convenience of each school.
3.—The scheme to be confined to the elementary schools in the area covered by the Longwood Gas Company.
4.—The boys, when visiting, to be controlled by an adult teacher.
5.—At the works, the scholars to be conducted round by a gas-works assistant; 40 minutes to be spent in the works, and 20 minutes in the office—the latter to be devoted to a short address on the history, &c., of gas lighting.
6.—To the scholars from each school the Gas Company will award three prizes of the following respective values in books or apparatus: First, 5s.; second, 3s. 6d.; third, 2s.
7.—These prizes will be awarded for essays upon the visit, which must be written in school hours (say, one hour allowed) under the supervision of the teacher, and certified by him as the unaided work of each scholar.
8.—Essays to be delivered at the Gas Offices within ten days of the visit. Marks to be given in the following proportions: Substance of essay, 60 per cent.; order of regularity, 20 per cent.; neatness, 20 per cent.
9.—The final adjudication to be made by a representative of the Gas Company in conjunction with a member of the Education Committee, the latter to be selected from the Sub-Committee of the school from which the boys come.
10.—Each school to be in all respects separate, both in visits, competition, &c.

There was one weakness in this scheme; it did not give the girls a chance; and yet the senior girls in all the elementary schools are taught plain cookery, usually with the aid of a gas-cooker, and cannot be considered to have absolutely no interest in gas. To them, however, the manufacture of gas could have no charms. It was resolved, therefore, to draw up a prize scheme for the girls in the cookery sections. The West Riding County Council will not permit more than 18 girls to receive instruction in cookery at one time, and this number is termed a "section." The girls' scheme was as follows:—

Girls' Cookery Classes.

1.—To have a demonstration by the Cookery Mistress of the uses of (*a*) the gas-cooker; (*b*) the gas-boiler; and (*c*) the gas-iron.
2.—A practical examination to be held at each school for those girls in the cookery class; the examination to be based on the demonstrations of the Cookery Mistress in conjunction with the practical work upon same.
3.—As the number in each practical lesson is limited to 18, a prize of 5s. will be given to the girl doing the best work in each section.
4.—A lady member of the Education Committee to arrange any other detail in connection with this competition not provided for here.
5.—A lady member of the Education Committee to adjudicate upon the work, and to decide the prize winners.

The joint schemes were laid before my Directors, and with

unanimity they authorized me to submit the same to the local Education Committee, together with the following letter:—

E. T. Woodhead, Esq., *May* 18, 1905.
Clerk to the Colne Valley Joint Education Committee.

Scholars' Visit to Gas-Works, &c.

Dear Sir,—The Directors of this Company authorize me to make an offer to your Committee upon the lines of the draft enclosed herewith. In formulating this general idea of the scheme, I have been courteously assisted by Mr. Lyddon, the Head Master of the New Street School. The Company conceived the idea in the first place through a request from one of the elementary schools that the elder scholars be allowed to visit the gas-works. It is obviously better to give these facilities to all the schools, and the prizes are offered to give increased interest to the scheme. My Board believe that similar arrangements made with respect to the other staple trades of the district would provide a valuable medium of education, and stimulate observation and the desire for learning at an age when these qualities are eminently desirable—viz., when the boy is nearing the end of his elementary education. They sincerely hope that this offer will receive your favourable consideration.

Signed, on behalf of the Company,
JNO. HY. BREARLEY, Secretary.

After the scheme had been considered, the Clerk to the local Committee replied as follows:—

Mr. J. H. Brearley, Gas-Works, Longwood.

Re Gas-Works.

Dear Sir,—Your scheme forwarded on May 18 was considered on the 29th, and received with great favour. It will now be forwarded to the Head Office at Wakefield, with the recommendation of the District Committee, and through that office no doubt to the Inspector for approval.—Yours truly,

EDGAR T. WOODHEAD, Divisional Clerk.

Since then the Board of Education of the West Riding County Council have expressed their approval of the scheme.

There are nine elementary schools in our district—three within the limits of the county borough of Huddersfield, and six outside. The schemes described are to be given a trial in the six schools outside. There will therefore be six visits in one year, extending over about one hour each, including a short elementary lecture, after going through the works, summarizing the objects of interest pointed out to the scholars. It will not, as will be seen, throw much extra work upon the officials of the Company. The total prize-money amounts to not more than six guineas per annum; or if all the nine schools are taken in, to nine guineas.

This review has so far dwelt only upon the advantage to the boys and the cause of education. If it interests other gas engineers, no doubt each will be able to come to the conclusion that in more ways than one the advantages are mutual. The writer believes that during the next few years there will be a considerable extension of the idea described above; and already there is some talk here of applying it to all the principal industries of the district. Supposing the boys in their last elementary school year spend one half day per fortnight in visits of this kind—varying the industry, of course—what a fund of valuable impressions will be made! The desire for knowledge will be strengthened, and the young mind fired with a healthy ambition. Tuition given outside the walls of the school has a fascination for the average schoolboy peculiar to itself.

THE ANALYSIS OF SPENT OXIDE.

By H. LEICESTER GREVILLE, F.I.C., F.C.S., &c.

In my last article (in the "JOURNAL" for Sept. 19, p. 750), I described the usual method for the determination of the amount of free sulphur in spent oxide, with special reference to a method of my own which, while saving time, did not diminish accuracy. There are, however, occasions on which the determination of sulphur by simple extraction with carbon bisulphide cannot be regarded as accurate. I allude to samples derived from the purification of water gas. In this case, heavy, oily hydrocarbons are often present, which would be weighed with the sulphur residue and counted as free sulphur, even with the usual precaution of light fusion before weighing. I had a case of this kind some years ago, where there was no less than 9 per cent. of heavy hydrocarbons present. It would seem easy to wash out these hydrocarbons with some suitable solvent which would not dissolve sulphur. Many experiments were tried in this direction; but all resulted in failure. The usual solvents which would freely dissolve the heavy hydrocarbons also dissolved sulphur to a minor degree. Even petroleum ether, which would seem theoretically to be the most promising material, failed—10 oz. measure dissolving 4·7 grains of sulphur. As the result of my investigations, any possibility of washing out the hydrocarbons by a solvent which would not partially dissolve sulphur was abandoned.

As an alternative, a different process was tried. The solution obtained by the treatment of the dried oxide by carbon disulphide was made up to a measured bulk. A platinum basin was charged with a finely powdered mixture of potassium nitrate and sodium carbonate, the former predominating. Then into this was run a measured quantity of the carbon disulphide solution, and the whole carefully mixed and dried in the water-bath to expel all traces of CS_2. The mass was then fused. Under these conditions, the sulphur would be oxidized and sodium sulphate formed. On solution, acidification with hydrochloric acid, and precipitation with barium chloride, washing, and subsequently weighing, a basis could be made with regard to the percentage of sulphur in the sample.

There is, however, some suspicion that, operating by this method, as the sulphur is in the free state, some proportion might be volatilized before oxidation. I have therefore lately adopted a different method, which I will now describe. It is founded on two facts. In the first place, that caustic soda is capable of dissolving sulphur on heating; and, secondly, that the dissolved sulphur can be completely oxidized to sulphuric acid by potassium permanganate. Under suitable conditions, the process is absolutely accurate. As a test, 50 grains of pure sulphur were taken and dissolved in a strong solution of caustic soda by the aid of a gentle heat. On complete solution, the liquid was cooled and diluted to a volume of 250 c.c., of which 50 c.c. was taken for analysis, or equal to 10 grains of sulphur. The barium sulphate came to 72·8 grains, which equals 9·996 grains of sulphur. This proves the accuracy of the method.

The exact method of procedure with regard to oxides is as follows: Take (say) 250 grains of spent oxide, and dry at 212° F. for moisture. After drying, place on a filter-paper, and wash with boiling hot distilled water until free from sulphocyanides and sulphates. Place the residue and filter-paper in a flask, and digest with a strong solution of caustic soda for about half-an-hour. The solution can then be decanted into a 500 c.c. flask; the residue in the flask used for boiling being washed with hot distilled water until the measure of the 500 c.c. is obtained. On filtration, 50 c.c. are taken for analysis. This represents one-tenth of the sample—25 grains. This filtrate is diluted with distilled water and potassium permanganate added in excess—that is to a marked pink colour. Hydrochloric acid is added, when an evolution of chlorine takes place; and then oxalic acid added, till the precipitated manganese dioxide has entirely dissolved. The solution is afterwards boiled, and if the oxidation is complete a clear solution will be obtained. Barium chloride is then added, and a precipitate of barium sulphate obtained, which is collected on a filter paper, and thoroughly washed, and weighed. A simple calculation then gives the proportion of sulphur present: 7·28 grains of barium sulphate are equivalent to 1 grain of sulphur. This gives a large margin for possibilities of error.

An experiment made by this method on a sample of normal spent oxide gave the following results:—

	Per Cent.
Sulphur by carbon disulphide	62·0
Sulphur by oxidation method	60·3
Difference from hydrocarbons	1·7

There is no doubt that all spent oxides contain a certain (or one might say an uncertain) proportion of heavy hydrocarbons; but the amount in ordinary cases is small. In the use of oxide on water gas, it may, on the contrary, be large; and some process of differentiation is necessary. Of course, it is absolutely necessary, for purposes of accuracy, that all the chemical reagents used should be so far pure as to be free from sulphates.

A COMBINED METHANE AND COAL GAS APPARATUS.

Elworthy and Williamson's Patent.

Among the patent specifications that have been recently issued, is one for "Improvements in and Relating to the Manufacture of Gas for Illuminating, Heating, and Power Purposes, and in Apparatus therefor." The patent, which is dated June 25, 1904 (No. 14,333), was taken out in the names of Mr. Herbert S. Elworthy and Mr. Sidney Williamson; and as more is likely soon to be heard of the process for which they claim protection, it will be of interest to give some fairly full particulars as to the plant and its working in this column, rather than in the usual "Register of Patents."

The gas is substantially coal gas, but with some important differences—namely, there is, as compared with ordinary coal gas, less hydrogen and more methane, and there is a partial or total absence of carbon monoxide and (or) carbon dioxide, depending on the temperature at which the reaction is carried out.

The invention, in one form, consists in submitting gas obtained from the destructive distillation of coal, bitumen, or other similar source of gas (hereafter referred to, for the sake of convenience, as "coal gas") to the action of metallic nickel, at a temperature suitable to bring about the conversion of the hydrogen and the carbon monoxide and (or) carbon dioxide present in the coal gas into methane and water—the methane produced becoming mixed with the residue of the coal gas. In another form, it consists in submitting a mixture of coal gas and water gas, or coal gas and producer gas, or coal gas and Dowson gas, or coal gas and any other form of water gas or producer gas, to the action of metallic nickel at a temperature suitable to bring about the conversion of the hydrogen and carbon monoxide and (or) carbon dioxide into methane and water—the methane produced becoming

mixed with the residue of the gas or gases not taking part in the reaction.

In carrying the invention into effect, hydrocarbons other than methane should be separated from the coal gas before passing it over the nickel. This may be done by passing the coal gas through a scrubber containing a suitable solvent—for instance, hydrocarbon oil; and in this way, the higher hydrocarbons are separated from the gas. The coal gas, either alone or mixed with any of the other gases mentioned, is then passed over metallic nickel at a suitable temperature for producing methane from the hydrogen and carbon monoxide and (or) carbon dioxide. The resulting gas may be afterwards enriched with the hydrocarbons previously abstracted (or with other suitable hydrocarbons), to increase its illuminating properties. If, however, the resulting gas is to be used for furnace or other like purposes—where it is not necessary to enrich it—the restoration of the extracted hydrocarbons may be dispensed with. The hydrocarbons removed from the gas by the solvent may be recovered by distillation in the usual way; the hydrocarbon oil or other solvent being used over again.

The ammonia should also be removed from the coal gas before it is subjected to the action of the nickel. This may be effected at any suitable stage of the coal-gas manufacture, as also the removal of the sulphuretted hydrogen and other impurities, by any of the well-known processes.

According to the methods of making coal gas usually practised, care has to be taken to conduct the manufacture at a proper temperature, so as to secure the prescribed illuminating power; and, further, it is well known that the manufacture of coal gas can only be conducted from gas coal of a certain quality. By means of this invention, however, it is said to be possible to obtain a greater yield in quantity of coal gas by conducting the manufacture at a higher temperature, and coal of an inferior quality, if necessary, may be utilized.

It is also well known, the patentees remark, that carbon monoxide and carbon dioxide lower the illuminating value of the gas to a very great extent; and the monoxide has a very powerful poisonous effect. Hence the substitution, as proposed by this invention, of methane for the oxides of carbon usually contained in ordinary coal gas must "largely increase its illuminating power and reduce its noxious character."

The specification proceeds: For the purposes of the invention, an ordinary coal-gas plant or a coke-oven plant may be used, and the operation of distilling the coal can be conducted with less regard to the illuminating power of the gas than has hitherto been possible. "The gas thus obtained is therefore larger in quantity than that ordinarily produced by the gas companies, and its subsequent treatment will depend upon the constitution of the gas."

Let us first suppose (the inventors say) that the gas to be subjected to the action of nickel is coal gas of the ordinary type. This gas may be said, after removal of the tar, ammonia, sulphuretted hydrogen, and other impurities contained in the crude gas from the retorts, to be approximately composed of the following constituents:

Hydrogen	40 to 50 parts.
Carbon monoxide	6 ,, 10 ,,
Carbon dioxide	3 ,, 6 ,,
Methane	30 ,, 40 ,,
Naphthalene and other hydrocarbons	6 ,, 10 ,,

This gas—that is to say, the coal gas—after purification from the tar, ammonia, carbonic acid, sulphuretted hydrogen, and other impurities (although the treatment with lime for the removal of the carbon dioxide contained in the crude gas may be omitted if desired, thus effecting an important saving), is passed, after removing the hydrocarbons other than methane, over metallic nickel at a suitable temperature to cause the carbon monoxide and dioxide to combine with the hydrogen to form methane and water; the oxide or oxides of carbon being hydrogenated, and the liberated oxygen converted into water by the excess of hydrogen present. The gas is thus deprived of the oxides of carbon and a large quantity of its hydrogen; and, in place of these gases, methane is substituted. The nickel apparently takes no part in the reaction, as at the end of the operation it remains unaltered.

In the part of the process where the gases are passed over nickel, the question of temperature is very important, as the conversion of carbon monoxide into methane in the presence of hydrogen and metallic nickel is different to that of carbon dioxide; and, consequently, when both oxides of carbon are present, and it is desired to convert them both into methane, the gas should be subjected first of all to the temperature required for the conversion of the carbon monoxide into methane, as otherwise it is liable to be converted into carbon and carbon dioxide ($2CO = CO_2 + C$), and afterwards to the higher temperature necessary for converting the carbon dioxide into methane. Or, if desired, the carbon monoxide or carbon dioxide may be separated by any convenient method and the remaining mixture of gases passed over the nickel at a suitable temperature to convert the carbon monoxide or dioxide left in the gas, as the case may be, into methane and water by combination with hydrogen.

As is known, the gas coming from the retorts during the destructive distillation of coal at first contains very little hydrogen and large quantities of methane and the higher hydrocarbons; but, as the distillation proceeds, the proportions are reversed, and during the latter part of the operation the hydrogen increases very largely. According to this invention, the gas first produced and that given off at a later stage is collected separately, and the latter part is used as a source of hydrogen for the methane. The first portion of the distillate may be employed for illuminating or other purposes, or it may be passed over nickel after the substantial removal of the hydrocarbons other than methane with or without water gas or producer gas, Dowson gas, or the like, to transform any oxides of carbon present into methane as before described.

If necessary, hydrogen may be added to the gases if they do not contain sufficient hydrogen to combine with the oxides of carbon present.

In cases where the coal gas has not been subjected to lime treatment for the removal of the carbon dioxide, it may be desirable to add a small proportion of hydrogen to bring the proportion of hydrogen to approximately the theoretical proportion necessary for combining with the oxygen of the carbon oxide or oxide to form methane and water.

The nickel may be simply placed in layers, in the powdered state, upon shelves arranged in the retort; or it may be caused to adhere to the surface of some porous material (as broken firebrick, pumice stone, or asbestos fibre), an agglutinating and not easily fusible substance being used—such as pipe clay, fire-clay, magnesium chloride, or other suitable material. Or the finely-divided nickel itself may be made up into balls or blocks of suitable size by being mixed with an agglutinating material, and preferably also with some organic material—such as sawdust—which can be easily burnt away and leave the blocks more porous. Or the nickel may be used in the form of fine foil or wire; or it may be placed in tubes made of wire gauze. The finely-divided nickel, as produced by the Mond reaction when the decomposition of the nickel carbonyl is conducted at a rather higher temperature than when it is desired to produce the nickel in a reguline state, is especially suitable for the purposes of this invention; and its employment therefor constitutes a feature of the invention. Copper or other metals, as wire or sheets or in other suitable form, and coated by nickel either by the Mond process or by any other means, can also be employed.

The nickel, however prepared, is placed in a retort, tower, or chamber heated internally or externally by any suitable means to the required temperature—say, for example, 250° C., for the carbon monoxide, and 350° C., for the carbon dioxide; and the gases may be heated before admission to the chamber. Or, instead of heating the chamber itself, the gas only may be heated if necessary to the required temperature before admission, as in this manner the reaction is more under control, since hotter or colder gas can be admitted at any stage of the reaction so as to control the temperature. As an alternative, the reaction chamber may be constructed with a series of tubes or pipes, through which, or outside which, a current of cold air, steam, or water is passed, in order to prevent the rise of temperature which takes place; the nickel being placed either in the chamber itself or in the pipes, as may be found most suitable.

As the control of the temperature is very important, owing to the carbon monoxide being decomposed into carbon and carbon dioxide at a comparatively slight increase over the normal temperature of the reaction, this control may be effected at any required stage by admitting a small amount of steam into the nickel chamber; or, instead of steam, a certain quantity of the gas made by a previous operation may be used—thus moderating the rise of temperature due to the exothermic reaction taking place.

As the temperature of the reaction with carbon monoxide is lower than the reaction with the carbon dioxide, the process is preferably conducted in two stages—the first part of the process at the lower temperature, to convert the carbon monoxide to methane (thus the reaction $2CO = C + CO_2$ is prevented), and the latter part at a high temperature in order to convert the carbon dioxide to methane; and the gases may be reheated during the intermediate stage. The two stages are preferably conducted in separate chambers.

In the specification of patent No. 12,461 of 1902,* there were set forth various processes for the production of methane on a commercial scale—starting from water gas; and in some of these processes it is necessary to add hydrogen for the purpose of assisting in the reaction. An improved type of hydrogen producing furnace was also described; and in all cases where it is necessary or desirable in the present invention to blend hydrogen with the gases before passing them over the nickel, the hydrogen furnace may be used with advantage.

It will, however, be seen from the foregoing part of the present specification that there is generally more hydrogen present in coal gas than is wanted for the conversion of the carbon monoxide and carbon dioxide present in coal gas to methane; and one feature of this invention is (as before described) to add coal gas to any form of water gas or producer gas or to Dowson gas—the mixture being subjected to the action of nickel, so as to cause the oxides of carbon to combine with hydrogen to produce methane.

If necessary, the coal gas added may be in such quantity as to be theoretically sufficient for the conversion of the carbon monoxide and carbon dioxide into methane according to the equations $CO + 3H_2 = CH_4 + H_2O$ and $CO_2 + 4H_2 = CH_4 + 2H_2O$. But, as will be readily understood, the proportion may be varied—depending upon the conditions of working and also the result

* See "JOURNAL" Vol. LXXXIII., p. 246.

which it is desired to attain and the use to which the gas is to be put. When the required quantity of coal gas is added to the water gas or producer gas or to Dowson gas, the mixture is submitted to the action of metallic nickel (as before described with reference to coal gas), and the resulting gas is conducted to a gasholder to be stored for use when required.

The apparatus which would be required for the purpose of carrying out the invention when coal gas alone or a mixture of coal gas and water gas is caused to react with the nickel, comprises substantially a coal-gas plant or coke-oven plant with a chamber or other receptacle for containing the nickel as described; also a scrubber in which a suitable solvent for the hydrocarbons (other than methane) in the coal gas is used to dissolve out the hydrocarbons. Instead of mixing coal gas and water gas (each obtained separately by the usual process of manufacture), a suitable mixture of the two gases may be obtained in an economical manner by the following process: Water gas made by any of the well-known processes is superheated either by passing it through hot blast-furnaces of the ordinary type, or preferably by passing it through incandescent carbon contained in an ordinary producer. It is thence passed direct into a second kiln or producer containing gas coal, whereby the latter is submitted to destructive distillation, and the coal gas formed mixes with the water gas, and the mixed gases (after suitable purification and removal of the heavy hydrocarbons) can then be submitted to the action of metallic nickel for the conversion of the oxides of carbon and hydrogen contained therein into methane and water as before detailed. The first part of the operation—namely, the manufacture of the combined coal and water gas—may be conducted in a pair of producers worked in combination, and each being alternately charged with gas coal, which, after distillation of the volatile parts, is heated up to a higher temperature by means of an air-blast, and used as the superheater. This pair of producers is worked in combination with an ordinary water-gas plant. The heating-up stage of the superheater is preferably conducted with air at a high pressure, so as to ensure the conversion of the coke into carbon dioxide as in the Delwik-Fleischer water-gas process, whereby a much higher temperature is produced.

In whatever way the invention may be carried into effect, it will be understood that hydrogen, or water gas, producer gas, Dowson gas, or the like (or any or all of these gases), may be added to the coal gas before it is subjected to the nickel, in order to secure a suitable proportion of hydrogen and oxide or oxides of carbon for the reaction to produce methane.

Fig. 1 is a side elevation (partly in section) of the apparatus employed in carrying out this invention, up to and including the stove for heating the reaction mixture. Fig. 2 is a sectional view of the nickel reaction chamber. Fig. 3 is a vertical section illustrating an arrangement of generator for producing a combined coal and water gas for use when a mixture of these gases is to be subjected to the action of nickel, as described.

A is a scrubber, consisting of a metal casing charged with a

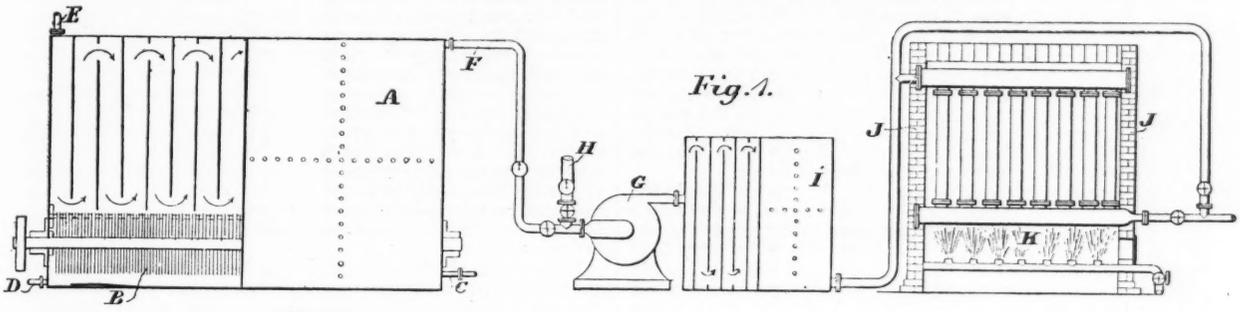


Fig. 1.

Fig. 2.

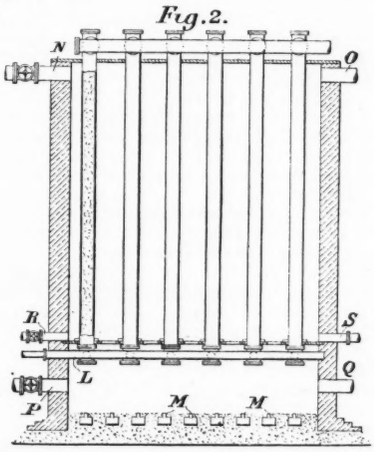
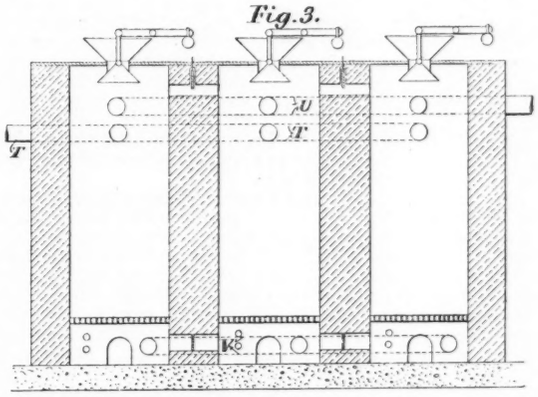


Fig. 3.



solvent suitable for separating some or all of the hydrocarbons other than methane present in the gas. For instance, ordinary paraffin oil of a moderately high boiling point may be used. B is a rotary brush mounted in the base of the scrubber, and driven by a belt pulley so as to revolve in the hydrocarbon, which is admitted to the base of the scrubber by the pipe C and flows away through the pipe D. The oil may be circulated through the scrubber by a pump (not shown) or other means, and may be treated in any suitable way to recover the absorbed hydrocarbons. The brush is driven at a relatively high speed, so that in revolving it sprays the hydrocarbon into the upper portion of the scrubber. E is the gas inlet-pipe and F the gas outlet-pipe. A series of vertical baffle-plates are disposed in the gas space of the scrubber; and these cause the gas to take a sinuous course therein, so as to be subjected thoroughly to the action of the oil. G is a fan for drawing the gas and sending it forward through the system; and H is a pipe (fitted with a valve) connected to plant for producing any kind of water gas or producer gas, or to a supply of hydrogen. When the gas is collected separately (as above mentioned), the pipe H may be connected to any suitable holder wherein the portion with the high content of hydrogen may be collected after purification and used to supply any deficiency of hydrogen in the gas to be treated. There is a valve fitted in the pipe F before the point of connection of the pipe H. When a mixture of the coal gas from the scrubber A and water gas, producer gas, or poor coal gas is to be used in the process, the relative proportion of the gases can be regulated at will, and meters may be interposed at any suitable points in the pipes F and H, so that the volumes passing can be regulated. If hydrogen has to be added to bring up the percentage to the necessary extent for the reaction, it may also be admitted by the pipe H.

The fan G is connected to a mixing-chamber I fitted with baffle-plates, whereby, when a mixture of gases is employed, they are caused to take a sinuous course through the chamber, so as to ensure intimate mixture. The outlet-pipe from this mixing-chamber delivers the gas to the heating or hot-blast stove J. This consists of a refractory brick chamber containing a series of vertical pipes opening into a horizontal pipe at the top and another at the bottom; the latter pipes being closed at one end. The top pipe is connected to the pipe from I and the bottom pipe to a pipe serving to conduct the gas from the heater to the nickel reaction chamber. A combustion chamber (preferably gas heated) K is provided in the heater; and in the base of this chamber a gas-pipe may be laid and provided with a series of burners to be fed with combustible gas from any suitable source—conveniently, with producer gas from the same source as that serving to supply the burners of the nickel chamber referred to later on. A bye-pass pipe, fitted above the chamber J, allows part or the whole of the gas to be sent round the heater instead of through it, so as to regulate the temperature of the gas entering the nickel chamber.

The nickel chamber, in the form shown in fig. 2, consists of a structure of refractory brick in which are mounted a series of vertical pipes closed at both ends, and supported on a bottom plate formed with holes or perforations over its surface for the passage of heating gases. The chamber is closed at the top by a plate. L is a common inlet-pipe connected to the pipe from J,

and adapted to admit the gas to the vertical pipes in the nickel chamber through openings or connections at the lower ends of the pipes. A common outlet-pipe communicates with the vertical pipes at the top, and serves to lead away the gases. The vertical pipes are filled with nickel in any of the finely-divided forms before mentioned. M are a series of a gas-jets disposed in the base of the chamber, serving for heating the chamber to start the reaction and for revivifying the nickel. They are supplied with producer gas admitted by any suitably arranged pipe. N and O are outlet-pipes for the gases of combustion or for the cold air or steam used for controlling the temperature of the nickel chamber; P and Q are air inlet-pipes for the combustion of the producer gas; while R and S are inlet-pipes for cold air or steam for temperature control. These three pairs of pipes are controlled by valves to enable communication to be opened and closed between them and the interior of the chamber; but they may be connected together, so that one valve serves for each door.

The operation of the apparatus is as follows: The gas from the retorts, coke-oven, or the like is first freed from ammonia, sulphuretted hydrogen, and other impurities in any ordinary way; and if it is not desired to convert the carbon dioxide (or, alternatively, the carbon monoxide) present into methane as mentioned, this may also be removed by any convenient means. The gas is admitted by the pipe E to the scrubber A, while the brush B is started and the pump is set running to circulate the oil through the scrubber. The gas is thus deprived of its hydrocarbons, other than methane, and is drawn away through the pipe F by the fan G. If the coal gas is to be subjected to the action of the nickel without the addition of water gas or other gas as above mentioned, the valve on the pipe will be closed; but when it is desired to add such other gases, the same are admitted by the pipe H—the valves being adjusted to secure the proper mixture for reaction in the nickel chambers. From the fan the gas or mixture of gases is delivered through the mixing-chamber I to the heater J, whereby it is heated to a suitable degree for the reaction in the nickel chamber, or to any other desired extent.

At the commencement of the reaction, the gas-jets M only are lighted and raise the chamber to the necessary temperature; the valve controlling the pipes P Q being opened to supply the necessary air for the combustion, and that controlling the pipes N O to allow the products of combustion to escape. Assuming the gas to contain substantially only carbon monoxide, the nickel chamber will require to be kept at about 250° C.; and as the reaction is strongly exothermic, it will be necessary to control the temperature. This may be effected by admitting steam or pumping cold air in through the pipes R S as required. With the same object, the necessary valves may be adjusted so that some or all of the gas is sent round the heater. In this way, the temperature of the reaction gases can be readily controlled and the reaction chamber kept at the proper heat. The gas admitted by the pipe L passes up through the nickel in the vertical pipes, and at the temperature above mentioned the carbon monoxide is caused to combine with the hydrogen to form methane and water. The resulting gas may be led through any suitable condenser (not shown) to arrest the steam present.

If it is required to restore to the gas the hydrocarbons extracted in the scrubber A, the oil from the scrubber may be distilled or treated for the recovery of the absorbed hydrocarbons as before explained, which may be effected in any ordinary type of pot still or tar or ammonia still; and the recovered hydrocarbons may be restored to the gas in any convenient way. For example, the distillate from the still may be received in a suitable vessel or chamber through which the gas is led, or any other suitable hydrocarbons can be used for enriching the gas. The gas, enriched or not, may be finally collected in a holder. When the gas to be treated contains substantially only carbon dioxide, the procedure will be similar to that above described; but the temperature of the reaction chamber will be kept at about 350° C.

If the gas to be dealt with contains both oxides of carbon, and it is required to convert them both into methane, the gas (after passing through the nickel chamber for the conversion of the carbon monoxide, as explained) may be led on through a second heater and nickel chamber—similar to those above described, and provided with analogous means for regulating the temperature of the reaction, as will be understood without further illustration. In this case, the temperature of the second nickel chamber will be regulated to about 350° C., so as to effect the conversion of the carbon dioxide; the resulting gas being led away through a condenser and enriched or not as before.

If it should be desired to adopt the modification wherein carbon monoxide is removed from a gas containing both oxides, and to subject the gas with the remaining carbon dioxide to the action of the nickel, this may be performed by making use of the Mond reaction; the gas being passed over finely divided nickel at a suitable temperature (about 50° C. for example), whereby the carbon monoxide combines with the nickel to form nickel carbonyl ($Ni(CO)_4$). The remaining gas may be then passed through the plant to the nickel chamber, as already described, and subjected to the action of the nickel at the proper temperature for the conversion of the dioxide. In this method, the hydrogen should be present in sufficient proportion to convert the carbon dioxide into methane and water, in accordance with the reaction $CO_2 + 4H_2 = CH_4 + 2H_2O$, as before mentioned. The nickel may be recovered from the nickel carbonyl by slightly raising its temperature. The CO is thus driven off, and may be utilized in any desired way.

In whatever way the process is carried into effect, care must be taken, the patentees emphasize, that the hydrogen and carbon monoxide and (or) carbon dioxide in the gas, or mixture of gases, shall be in suitable proportion to yield methane and water on contact with the nickel. If insufficient hydrogen is present, the deficiency may be supplied by admitting hydrogen or coal gas or high hydrogen content by the pipe or other suitable connection; while if a mixture of coal gas and water gas, producer gas, Dowson gas, or the like, is to be treated, the gas to be added may be admitted by the same pipe or connection.

Should the nickel in the nickel chambers tend to become exhausted, it may be revivified as follows: The nickel is heated by the gas-jets M to (say) about 400° to 500° C., and a current of air is passed over it for a short time. Or the air may be heated to a suitable temperature in a hot-blast stove before passing it over the nickel. The air current is then stopped, and hydrogen or water gas at about the same temperature is sent over it, whereby the oxide produced by the air current is reduced and metallic metal reformed, which is then again ready for use.

The arrangement of combined coal and water gas producer is illustrated in fig. 3. This can be employed, as above explained, for the production of a mixture of coal and water gas suitable for use in the process. This apparatus comprises three refractory brick furnace chambers, each provided with a grate, charging hopper, charging valve, air-blast nozzle, and steam-injecting nozzle. The side chambers communicate at the top with the intermediate chamber by flues adapted to be closed by dampers, and at the bottom by flues similarly fitted with dampers. T is a pipe connected to a chimney or uptake not shown, and U is another pipe for leading away the gas produced. These pipes communicate with the respective chambers of the generator by flues fitted with suitable valves. Communication between the spaces below the grates of the chambers is also provided by means of a pipe V and flues opening into the spaces and likewise fitted with suitable valves. For small-sized installations, all three furnaces may be contained in one outer metal casing as shown; but in large-sized plants, it will probably be found more convenient for each element to be self-contained—the manner of working being nevertheless adhered to. In this case, a metal casing should be provided for each element.

In operation, the three chambers can be used either as a water-gas producer, superheater, or coal-gas producer; each in turn being charged as required. But to illustrate the working of the furnace it will be sufficient to describe the case, in which the first is used as the water-gas producer, the middle one as the superheater, and the third one as the coal-gas producer. The first two are charged with coke, and the third with raw coal—"preferably as used for commercial gas production." The fuel in all three chambers is ignited, and a strong blast of air is blown in through nozzles at the foot; the blowing being continued only for a short time in the third chamber, but for a longer time in the other two, or until the fuel in these two last-named chambers is raised to a high state of incandescence. The valves controlling the flues being open, the products of combustion pass away through them and the pipe T to the chimney; but they may first be passed through a superheater of any ordinary type, which may be subsequently used for superheating the steam before blowing it into the water-gas producer. When the temperature in the first and second chambers has reached a sufficiently high point, the air is shut off, and steam (preferably superheated beforehand) is blown into the first one and passes up through the fuel in the chamber, where it is decomposed, with the formation of water gas. Thence it passes down through the highly incandescent fuel in the second chamber, where it is strongly superheated. At the same time, any steam which has so far escaped decomposition is decomposed in the middle chamber. The highly superheated water gas passes on to the coal-gas producer, and as it rises through the raw fuel contained in it the volatile portion of the fuel is distilled; and the coal gas thus formed becomes mixed with the water gas and is carried away to the purifiers. It will thus be seen that one chamber is worked in the ordinary manner of a water-gas producer, one as a superheater, and the other as a coal-gas retort.

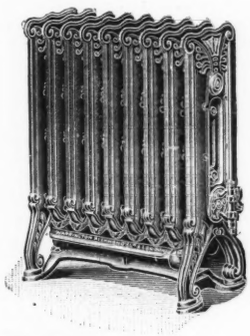
By appropriate manipulation of the valves, the furnaces may be changed in rotation, so that each in turn performs one of the functions of the plant—the chambers being charged in turn with gas coal, which, after distillation, can be heated up to a higher temperature by the air blast and used as the superheater. The superheater can be worked either with heated fuel, as described, or an ordinary chequer-brick filling may be used in it. In the latter case, it will serve permanently as the superheater.

Concluding their lengthy specification, the patentees say: "The combined water and coal gas should be purified, which may be effected in the well-known manner (the carbon dioxide being removed or not); and the gas can then be passed through the methane producing plant described or otherwise subjected to the action of nickel for the purpose specified, with or without the previous addition of water gas or producer or like gas, and with or without the previous addition of hydrogen, so as to provide an appropriate mixture for the methane reaction as explained."

We are pleased to announce that a donation of £50 to the Benevolent Fund of the Institution of Gas Engineers has recently been received from Mr. R. Hesketh Jones, of "Belfort," Park Hill Rise, Croydon.

THE GAS-FIRE SEASON.

Winter approaches; and the makers of gas-fires will be presenting gas engineers and managers with indications of the work that they have been doing in the way of providing further inducements to the extended use of gas during the cold months of the year. A few new productions are brought to notice by the Richmond Gas Stove and Meter Company, Limited; and they show that ingenuity in connection with means for utilizing gas for heating has not yet been even temporarily expended. There is not the slightest doubt that radiant heat—whether in the visible form of incandescent fires for the living room, &c., or invisible in the form of low-pressure steam, or in the really hygienic types of the condensing radiator, in which both are utilized—is gradually but surely replacing convected heat as given off by the air-warming and re-warming stoves so common a few years ago. Among the new designs of the firm is the "National" gas-steam radiator, of one of the small sizes of which an illustration is given. This radiator is made in three heights, and with tubes ranging in number from three up to eleven (with the even numbers omitted). There have been several objects in view in designing the radiator. In the first place, the sections which compose the radiator are of such external figure as to give a considerable radiating area in the space occupied. The tubes are without joint; and the whole are held together by bolts and nuts. Another important feature is that the heating chamber is raised well from the ground, so as to give a good clear space between the burner and the floor—thus obviating danger of fire or damage to the floor covering. Another structural feature is that the lighting is also accomplished in an exceedingly simple way—the protecting tray carrying the burner (atmospheric or luminous) being pivoted at one end, and being swung out at the other sufficient for the purpose. As the burner is made to swing out on either side of the radiator, it is equally adaptable to any position or situation of gas connection. The water is contained in the bottom parts of the tubes; and replenishing is only a matter for occasional attention—the combination of a gauge with the water-feeding inlet at the side giving a ready indication of the necessity for a fresh supply. The radiator is fitted with a patent automatic air-valve and automatic gas-inlet valve, which lowers the gas as the temperature of the radiator is increased—only allowing sufficient gas to pass to maintain the maximum temperature, without waste. Taking the 33-inch height radiator, the gas consumption per hour ranges from 6 cubic feet for the three-tube radiator to 21 cubic feet for the eleven-tube one—the heating surfaces of the tubes being for the three-tube size 13 square feet; for the five-tube size 21½ square feet; for the seven-tube size 30 square feet; for the nine-tube size 39 square feet; and for the eleven-tube size 47 square feet. With the greater and lower heights of radiators, these figures would proportionately increase or decrease. The finish is in various art shades and black. This addition to the goods of the Richmond Gas Stove and Meter Company's heating department is sure to command attention. As a heater, it occupies little room, requires a moderate amount of attention, and has a decidedly nice and serviceable appearance.



THE "NATIONAL" GAS-STEAM RADIATOR.

THE "OXFORD."

In the "Oxford" fire (which is also shown here), we see illustrated the modern tendency in this class of goods. The idea which has been successfully accomplished in the "Oxford" is to afford to the user the greatest quantity of heat from a fire occupying a small amount of space—in other words, to supply a small cased fire which, in its heating effect, shall equal the results of the old type of air chamber gas-fire, with its more extensive casing. The outside dimensions of the latter are often detrimental to it; and yet the firm confess that, until they devised the fire under notice, they have never been able to concentrate the efficiency given by the old fire into the smaller space. There has been another difficulty in the present-day tiled-side coal grate, with the overhanging canopy—viz., that of getting anything but a low fire to satisfactorily fit. In the new gas-fire, this difficulty has also been surmounted; and, instead of looking like an independent thing that second-thought has added to the coal-fire place, the fire looks, in most cases, as much like part of such fire-places, as a secondary fitting of the kind well can do. One more general point about the fire before giving particulars as to its construction. It is of an extremely neat design; and its ornamental features have been specially worked out with the view of getting some good effects with the firm's "Porcellanite" finish. The fire itself has a basket-shaped front, slightly bending inwards at the top, so that there is a full depth of fuel at the bottom, with a gradual decrease towards the top. The fire constructed in this way presents a large and cheerful incandescent surface. As gas-fires are let more and more on hire, the question of facility of maintenance is bound to correspondingly become a consideration of importance with gas authorities. Foreseeing this, makers are constantly using their best endeavours to provide accordingly. In this case, we have a fire that can be taken completely to pieces *in situ*, leaving only the back and sides shell. By taking a couple of ornamental knobbed screws from the sides and a screw or two from the front, the fire-brick, the whole of the front, and the reflecting-plate can be removed. The idea of making the reflecting-plate slope (as illustrated) from the fire is to assist in directing the heat to the floor; and, with "Porcellanite" finish to the reflecting-plate, the radiation from it is very considerable. With the front removed, the burner can also be slid out, leaving only the firm's attachment for adjusting the air supply to meet the pressure of the gas or the varying proportions of water gas in the town's supply. It is noticed also that in their fires, the Company have adopted a more porous fire-brick than hitherto, as, in their experience, it is found to offer less resistance to the heat, and is less likely to crack. Besides this, in these new fires the brick is not fitted closely to the cast-iron casing, so that there is plenty of room for expansion and contraction of the metal without bearing upon the brick. Sufficient has been said to show that it is a simple matter to maintain and keep clean such a fire as this. Underneath the top of the stove there is what the Company call a heat-utilizing chamber. It is a series of large tubes, the front one of which collects the heated products of combustion, and then offers them four different routes to the exit-pipe at the back. Through this arrangement, the amount of heat radiated from the top is, there is no question, somewhat remarkable. This chamber is also removable for replacement, if this should be considered necessary, by merely taking out two screws. There is also a boiling-burner on top. The fires are finished in black and eight colours of "Porcellanite;" and to describe them as elegant is not an exaggeration.

Other of the Company's fires have been the subject of improvement. There is the "Register" fire, to which ornamental hold-fasts have been attached. The Company are also supplying fires with the firebrick removable and renewable in pieces, and which can be taken from the fire at any time without interfering with the front. Top boiling-burners too are now made removable if preferred. Among other novelties noticed were a kettle contained in a cast-iron casing hinged to a boiler-ring, and a griller and boiling-ring plate, giving all the conveniences of the top of a cooker. This latter is intended for slot-meter installations where the conditions do not allow of a cooker. A large gas-boiler to take the place of the ordinary coal-fire copper is worth inquiring into by those who are looking out for fresh means of increasing the day consumption.

Novel Advertisements of Gas Stoves and Fittings.

The British Gaslight Company are about to open, in the principal street in Hull, a new show-room for the sale of stoves, fittings, &c.; and with the view of getting a cheap and serviceable advertisement for it, the Engineer and Manager of the Company's station in that town (Mr. John Young) has adopted a suggestion made to him which is certainly novel, and we believe will be very effectual. The Company collect per annum copper equal to 80,000 rolls of 5s. each from the prepayment meter consumers. The brown paper in which the coppers are wrapped now bears upon it, in prominent characters, announcements that the Company sell or let on hire gas-stoves on terms named, make no charge for fixing, and keep on sale at their show-rooms all kinds of gas-fittings. These announcements are so arranged that by altering the method of wrapping four distinct kinds of advertisements are obtained. As the wrapped copper circulates among the consumers (principally tradespeople), the opportunity afforded them by the Company of further availing themselves of the advantages of gas is constantly being brought under their notice; and this is done at the cost of printing only. The suggestion is offered to other gas managers who care to make use of it. In connection with the gas exhibition at Newcastle-on-Tyne, the Gas Company have sent out by post to consumers no less than 15,000 leaf blotters (5¾ in. by 4¼ in.) as reminders that they supply gas-fires and other heating appliances on hire and hire-purchase, that these are fixed free up to 30 feet of piping, and that the approach of winter is a good time to visit the Company's show-rooms and make a selection. The blotter also shows the hire rentals and the hire-purchase rentals.

POPULAR LECTURES AT THE NEWCASTLE GAS EXHIBITION.

In the notice of the opening of the exhibition of gas appliances at Newcastle-on-Tyne which appeared in the "JOURNAL" for the 19th ult. (p. 761), it was mentioned that in connection with it some short popular lectures were to be given. We are pleased to be able, through the courtesy of Mr. John Lewis, the Distributing Superintendent of the Newcastle and Gateshead Gas Company, who is Joint Manager, with Mr. W. A. Cowie, of the exhibition, to give a summary of three of them.

Mr. W. DOIG GIBB, M.Inst.C.E., the Engineer of the Newcastle Gas Company, dealt with the subject of

COAL AND ITS USES.

The author began by pointing out that very few people ask the question, "What is coal?" or perplex themselves with curious inquiries into its composition and history; and yet this "unlovely and uninviting substance" had, he said, a history which, for extent and remarkable incident, was well worth tracing. He then proceeded to show how, ages before man, or even the species of animals and plants contemporaneous with him, had appeared upon the earth, there flourished a strange vegetation remarkable for its luxuriance, and that these masses of ancient vegetable matter constitute the coal of the present day. While this was now freely admitted, there was not, he remarked, such perfect agreement as to the methods by which the change had been effected. The generally accepted theory was that in the course of geological change this vegetable matter became gradually compressed, and sank to so low a level that marine or fresh water sediment, or both, was deposited over it. Then vegetation once more spread and flourished to furnish another accumulation of matter, which in its turn became submerged and buried under sediment; and so on in successive alternations of organic and sedimentary deposits. By the slow process of chemical decomposition without access of air, modified also by the mechanical pressure of the later formations, the vegetable deposits, accumulated in the manner described, had, after the lapse of ages, become transformed in the substance now familiar to us as coal—one of the chief agents in our industrial supremacy as a nation. But though coal is essentially a product of the Carboniferous Age, Mr. Gibb said it must not be concluded that it is not found in any other geological formation. It occurs in many districts in conjunction with ironstone; and this is another cause of our high rank as a manufacturing nation. This association, however, is not the result of chance, but is probably due to the reduction and precipitation of iron compounds by decomposing vegetation.

Mr. Gibb then went on to show that from coal we get not only mechanical work when it is burnt to generate heat, but chemical work when it is employed to reduce a metallic ore, or is used as a source of carbon in the manufacture of certain chemical products, such as the alkalis. It is therefore a substance which supplies us with the power of doing work in mechanical, chemical, or some other form; and anything which does this is said to be a source of energy, which, like matter, is indestructible. After briefly referring to the establishment, as the result of the joint labours of many philosophers, of the principle of the conservation of energy, Mr. Gibb pointed out that to the late James Prescott Joule belongs the credit of having been the first to measure accurately the amount of work which can be done by a given quantity of heat. He did not consider it necessary to explain the methods by which an exact equivalent was obtained, but merely stated that the application of the law would show just how much power was obtainable from a certain weight of coal if the quantity of heat given out when it was completely burnt were measured. Our average coal might be said to have a heating power of 13,890; in other words, 1 lb. of coal would, on complete combustion, raise the heating of 13,890 lbs. of water 1° Fahr., if all that was generated could be collected and applied to this particular purpose. But the little word "if" was often a great barrier, and in this case it was an insurmountable obstacle; for if we expressed this quantity of heat in its mechanical equivalent, and expected to get the corresponding quantity of work out of 1 lb. of coal, we should be very much disappointed. Mr. Gibb gave a few examples in support of this statement,

Reverting to the subject of the indestructibility of energy, the author remarked that the inquiry following in natural sequence was as to the derivation of the enormous store of it to be found in coal. A general knowledge of the origin and chemical composition of the mineral would, he said, enable their question to be answered. The origin of coal having already been explained, he proceeded to deal with its chemical composition. He showed how it consists chiefly of carbon, in conjunction with small quantities of hydrogen, oxygen, nitrogen, sulphur, and water, and a certain amount of mineral matter left as ash when the coal is burnt. Carbon is by far the most important constituent; being from 70 to 90 per cent. by weight of the whole. Having explained the nature of this substance, Mr. Gibb said it would burn in air, and when this was done it united with oxygen to produce carbon dioxide. Though this gas was invisible, and the carbon seemed to disappear, it was not really lost. Here, then, was the chief source of the energy of the coal—the carbon of the plants which grew and flourished ages ago, and the oxygen of the air, uniting with it on the ignition of a fire, restores some of that latent energy. The author explained how this energy originated, taking for his example the growth of a plant; and he arrived at the following results: (1) That the chief source of the energy contained in coal is the carbon; (2) that this carbon formed part of the plants which grew during the carboniferous period; (3) that the carbon thus accumulated was supplied to the plants by the carbon dioxide existing in the atmosphere at the time; and (4) that the separation of the carbon from the oxygen was effected in the presence of the green colouring matter of plants by means of the solar energy transmitted to the earth during the period referred to. The interesting conclusion was therefore arrived at that the heat obtained from coal is sunlight in another form—"bottled-up sunshine," as George Stephenson called it.

Mr. Gibb next stated a little more clearly the nature of the change which occurs during the transformation of wood into coal, and then passed on to the subject of the destructive distillation of organic substances. He explained that in this process four different things are always produced—gas, watery liquid, thick tarry liquid, and solid charcoal or coke. He said he did not propose to describe the method of distilling coal for the purpose of making gas, as this would be done on a subsequent evening by Mr. Hardie. He nevertheless gave some interesting particulars connected with gas manufacture; dwelling specially upon the value of the residual products at the present time as compared with the early years of the industry. Summing up the uses of coal, he pointed out that it is employed as a fuel, which is a source of heat and therefore of energy, and that it is utilized for the production of gas, coke, ammonia, perfumes, dyes, oils, volatile spirits, disinfectants, &c. "Nature has provided us very lavishly," said Mr. Gibb, in conclusion, "with this source of power and wealth; but the idea naturally suggests itself whether we are not drawing too liberally upon the store. The question of coal supply crops up again and again; and the public mind is periodically agitated about the prospects of its continuance. There seem to be about 200,000 million tons of coal known to exist still unworked; so I do not think it necessary to further agitate your minds to-night about the prospect of having to spend some future Christmas Day without a fire."

Mr. T. HARDIE, the Superintendent of the Redheugh station of the Newcastle-on-Tyne and Gateshead Gas Company, gave a lecture, illustrated by lantern slides, on

THE MANUFACTURE OF COAL GAS.

He remarked that until recently it was sufficient, if one intended to speak about coal gas, to use the word "gas" alone; but now it was necessary to be more explicit. The unparalleled success of coal gas for lighting, heating, and motive power had caused a good many inventors to try to find some substitute for it. In this endeavour, they had been partly successful; and the result had been that there were now dozens of gases—oil gas, carburetted water gas, Mond gas, Dowson gas, acetylene gas, petrol gas, and many others, all of which had their advantages under certain conditions. But not all of them together, much less any one of them singly, had been able—in this country, at any rate—to take the place of coal gas to any considerable extent; and those who had studied the appliances shown at the exhibition would, he thought, agree with him that he would be a bold man who would prophesy that, so long as coal was plentiful, gas made from it would be ousted from its premier position.

With these introductory observations, Mr. Hardie proceeded to say that since William Murdoch first lighted his offices at Redruth with coal gas in 1792 and the Chartered Gas Company lighted Westminster Bridge in 1813, the manufacture of coal gas had gone forward by leaps and bounds, until now the quantity of coal used for the purpose exceeded 18 million tons annually. The class of coal most suitable for the manufacture of gas was bituminous or caking coal—*i.e.*, coal which, when heated in a closed vessel until the volatile matters had been expelled, yielded as residue a coke different in outward form from the coal from which it was produced. Having indicated the characteristics of caking and non-caking coals, the author remarked that distillation was carried on in fire-clay retorts heated externally by three different types of furnace—the direct-fired, the generator, and the regenerative; the last being the one most generally in use. He explained the principle of its construction; and then gave particulars as to the retorts and the methods of setting and working them. He showed how the heavy manual labour of charging and drawing had been greatly lightened by the introduction of machinery and the adoption of the inclined system of setting.

Having followed the coal up to its introduction into the retorts, the author described the succeeding operations of condensing, washing, and purifying the crude gas produced by its carbonization. He pointed out that the result of the distillation process was the production, besides the gas, of three valuable bye-products—viz., coke, tar, and ammoniacal liquor. The quantity of gas yielded by a ton of ordinary gas coal was about 11,000 cubic feet, of an illuminating value of 14 to 15 candles, about 14 cwt. of coke, 10 gallons of tar, and 30 gallons of ammoniacal liquor. At Newcastle, about 10½ cwt. of coke were sold; the remainder being used in the works for heating the retorts and other purposes.

Tar was very little used in its crude state, and was generally sold to distillers, who produced from it an almost infinite number of substances, the most important of which were benzene, benzol, naphtha, carbolic acid, creosote, anthracene, and pitch. The ammoniacal liquor was usually dealt with at the gas-works, and converted into sulphate of ammonia, of which about a ton was produced from every 100 tons of coal carbonized. This salt was invaluable as a manure, on account of its large percentage of nitrogen.

All the operations connected with gas manufacture having been described, Mr. Hardie brought his lecture to a close by explaining that on leaving the purifiers the gas is practically free from impurities, and in a condition to be supplied to the consumer. It was measured by the station meter, through which it passed to the holders, where it was stored and sent out as required. As the holder would deliver gas into the town at a greater rate than would ensure economy in the consumption, a governor was fitted on the outlet to regulate the pressure. The gas was then supplied to the consumers; and the exhibition bore evidence that the uses to which it might be put were practically illimitable, and showed how it could be most economically employed under a great variety of conditions.

Mr. W. HARDIE, Assoc.M.Inst.C.E., the Engineer and Manager of the Tynemouth Gas Company, gave an instructive discourse, illustrated by experiments, on

HOW TO BURN GAS.

After briefly referring to the remarkable energy now being displayed by those who are engaged in the gas industry in developing its use for lighting, heating, motive power, and industrial purposes, Mr. Hardie pointed out that while great improvements have been made in the manufacture and distribution of coal gas, which, by leading to increased consumption, have caused a gradual, but at the same time very considerable, reduction in price, those which have been effected in the methods of burning it have been even more marked, and this has tended to further cheapen the light. He laid stress on the desirability of consumers getting all the efficiency possible out of their gas; and said that the object of exhibitions such as the one then being held was to help them to do so, by bringing under their notice the most up-to-date, economical, and efficient burners and appliances, and having the methods of using them explained. Mr. Hardie remarked incidentally that the exhibition was one of the best of the kind he had ever had the pleasure of attending. He said he did not, in his lecture, intend to make special reference to any of the exhibits, but rather to explain, in a simple, practical, and general way, the principles on which gas is consumed in a few types of burners for purposes of illumination, and then to refer briefly to gas as a heating agent.

Having explained the composition of coal gas and shown by experiment how its illuminating power could be greatly increased by the addition of benzol, Mr. Hardie said that, in order to get the maximum amount of light from any gas, one of the most important things was to supply to the burner the right quantity of air in a suitable manner. He illustrated his remarks by partially stopping the supply to an argand burner, with the result that the brilliancy of the flame was destroyed. He then lengthened the chimney, in order to draw air more quickly through it, and both the size of the flame and the light were much reduced. The quantity of air required for the complete combustion of coal gas was nearly six volumes of air to one volume of gas—depending, of course, on the composition of the gas. The nominal illuminating power of the gas supplied in England varied from 14 to 20 candles; but Mr. Hardie called attention to the fact that only a small quantity of gas is now used in the form of luminous flames, the larger proportion being employed with incandescent burners and for cooking, heating, and motive power, for all of which purposes the heating value and not the candle power is the important thing.

Coming to the subject of gas-burners, Mr. Hardie traced the evolution of the fish-tail from the circular-flame burner, and showed how it was produced. He next described argand and regenerative burners, and then came to the burner now so largely used—the incandescent. Comparing the light given by these burners, he said a good flat-flame burner, consuming 5 cubic feet of gas per hour, would yield about 3 candles per cubic foot; the standard argand, 3·2 candles; a Welsbach "C" burner, 17·1 candles; a "Kern" burner, 25 candles; and a Welsbach self-intensifying burner, 30 candles. But even higher results than these were obtained with the high-pressure system of burning gas. Inverted burners, now largely used, gave about the same lighting effect as the vertical kind, and lent themselves well to artistic effect. Incandescent burners, for indoor and outside lighting, were rapidly replacing the flat-flame type. The lecturer emphasized the point that the illuminating value of gas is of small moment with incandescent burners, the efficient operation of which depends upon its heating power; and he then showed, by an experiment, that nearly three-fourths of this is due to non-luminous gases. Dealing with the use of globes to soften and diffuse the light and make it agreeable to the eyes, he told his audience that they should so arrange the burners and globes in their houses that the full glare from the mantle would not strike the eye. Of course, for large halls and outdoor lighting this is less important, especially if the lights are placed high, so as to be out of the field of vision.

Before leaving the subject of lighting, Mr. Hardie gave the following figures showing the cost of gas when consumed with the burners he had mentioned; taking them as each using sufficient gas to give the light of 1000 candles:—

Flat-flame burners, using 333 cubic feet of gas per hour	6¾d. to 8d.
Argand do., using 312 feet.	6¼d. ,, 7½d.
Welsbach "C" do, using 58 feet	about 1¼d.
Welsbach "Kern" do., using 40 feet	,, 1d.
Self-intensifying burners, using 33 feet.	,, ¾d.

Putting the figures differently, they show what each system will do for a penny:—

Flat-flame burner gives	15	candles	for 8½	hours.
Argand ,,	16	,,	8½	,,
Welsbach "C" ,,	60	,,	12	,,
Welsbach "Kern" ,,	100	,,	10½	,,
Self-intensifying ,,	150	,,	8½	,,

Mr. Hardie explained that the foregoing figures were based on gas at 1s. 8d. and 1s. 11¾d. per 1000 cubic feet, which prices he thought were slightly higher than those charged in Newcastle.

Leaving the subject of lighting, the lecturer proceeded to offer a few observations on the use of gas for cooking and heating. He remarked that it seemed almost unnecessary to say anything in favour of using gas for culinary purposes, as gas-stoves had, by their many advantages, gradually overcome the prejudice which once opposed their adoption. In his own town, three out of every five gas consumers used cooking-stoves. But in many places the proportion was even greater than this; and the number was constantly and rapidly increasing. Many things had contributed to this result. Gas was handy, clean, reliable, and cheap; and it allowed a very fine adjustment of the heat. It had been placed beyond doubt that meat cooked by gas was quite as wholesome as that cooked by a coal fire; while it was more palatable, and there was less loss. It was generally calculated that about 100 cubic feet of gas per day would do the cooking for a medium-sized family; and with gas at 1s. 11¾d. per 1000 cubic feet, this was less than 2½d. per day. A constant supply of hot water in a house was very useful; and theoretically 50 gallons of water could be raised 50° Fahr. for 1d. A good water-heater might have an efficiency of some 75 per cent. In ordinary practice, therefore, 35 gallons could be heated 50° Fahr., or 10 to 12 gallons to boiling-point, for 1d.

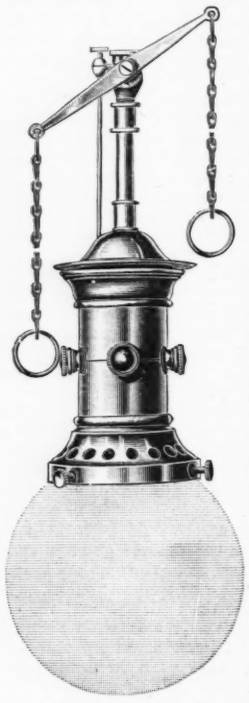
With regard to heating by gas, Mr. Hardie said that though a large number of gas-fires were in use, they had not attained the same popularity as cooking-stoves. One reason for this was because they had not been "pushed" in the same way that cookers had; and another (probably the chief) because they were more costly than a coal fire, if taken on the comparison of fuel cost only. But if the labour, dirt, and trouble involved in attending to a coal fire were taken into account, it would be found that there was not much difference between the cost of gas and coal. The quantity of gas used for fires varied from 10 to 40 cubic feet per hour, depending upon whether a large or a small room had to be heated; and the cost was from less than ¼d. to about 1d. per hour. If a gas-fire did not give satisfaction, it was either because it was of inferior construction or had been fitted up and was working under improper conditions. Gas used in houses was sometimes blamed for causing what was called "stuffiness" in rooms; but the real cause was want of adequate ventilation. If gas was properly used, it was a simple, satisfactory, and cheap means of heating and ventilating rooms. There were three ways of effecting the latter object: (1) By ordinary currents of air; (2) by generating heat in the chimneys or flues; and (3) by mechanical means, which might either force pure air into the room or extract impure air from it. Heating and ventilation could be carried out with precision and exactness. Speaking generally, a gas-fire should have a flue-pipe carried into the chimney-shaft; and this pipe should be gas-tight, so that all the products of combustion might go up the chimney. Some of the heat should also pass up, in order to create a draught; but it should be reduced to as small a quantity as possible, and in no case exceed 25 per cent. of the total heat given off by the gas used.

After making a few further remarks on the subject of heating by gas, Mr. Hardie concluded his lecture by saying he had only been able to mention a few elementary facts in connection with the burning of gas. In the "battle of the lights" which had been going on between oil, gas, and electricity for the past twenty-five years, gas, he said, still held the premier place; and he ventured to think that it would not be in the near future that it would be shifted from this position. For cooking also it held the first place; while in many other directions, including heating and the production of power, it was gaining ground very rapidly.

The other lectures were on "Gas-Engines," by Mr. A. B. Roxburgh, of the National Gas-Engine Company, Limited; on "Coal Tar and its Wonders," by Mr. E. F. Hooper, of the Wear Fuel Works Company, Limited; and on "Some Commercial Uses of Coal Gas," by Mr. Herbert Lees. The first-named lecture was briefly noticed in the last issue of the "JOURNAL" (p. 821), and abstracts of the others will be given next week.

THE "EMPIRE" AND OTHER LAMPS.

Recent issues of the "JOURNAL" have seen several lamps illustrated and described; and among the points that will have been noticed is the recognition by makers that there is a field of lighting between those for which the ordinary incandescent burner and the high-power gas-burners are most suitable in which lamps of an illuminating power of between (say) 100 and 300 candles are specially applicable. It is an extensive field, comprising large shops, halls, refreshment bars, and quite a multitude of other interiors. Messrs. J. & W. B. Smith, of Farringdon Road, call attention to the fact that among the lamps which they are relying upon for the present season is the "Empire" lamp, and it is one with which confidently they are competing for place in the field to which reference is made. The lamp has excellent points. Situated among a variety of others in the show-room, its general appearance when alight causes one to pick it out for examination. It is a regenerative inverted lamp, and is made in four sizes—the two smaller being single mantle lamps, consuming respectively 3 and 4 cubic feet of gas per hour, and yielding, we are informed, an illuminating power of 90 and 120 candles. It is difficult to speak precisely as to illuminating powers, owing to variations in quality of gas and pressure; but the figures given here will not be found far wrong if the lamps are tested with about a 16-candle gas and under normal conditions. As to the two larger lamps, the third size carries two mantles; the consumption being 8 cubic feet, and the reputed illuminating power about 240 candles. The largest size is a three-mantle lamp, burning 10 cubic feet, and giving a light of 300 candles. The lamp, as the illustration shows, is quite enclosed. The top part of the lamp is composed of the gas-supply pipe with metal chimney. In this chimney are three regulating screws for adjusting the supply of air to the gas. The air is carried in by three arms to the gas-supply pipe; and those arms, like the gas-pipe, are fully exposed to the ascending hot products of combustion. The inlet for the air to support combustion is just above the rim carrying the globe; and this air passes down into the latter through the annular space formed by the bell-mouthed interior chimney up which the products of combustion pass. Everything therefore that goes to the flame is subjected to heat before reaching it. The lamp is fitted with a pilot light; and lever and chains for lighting and extinguishing. The light, being protected, is a steady one; and this reminds us that lamps of the kind, having closed globes, and fitted with reflectors, should find favour as billiard lights. Whether finished in polished brass, steel bronze, or nickel-plate, the lamp is a taking one.



THE "EMPIRE."

For outside lighting, the newest lamp that the firm has to show is the "Universal." It is made of a strong gauge of copper, finished in steel bronze and relieved, or in polished copper, or enamelled green, or in white steel. The lamps are made for two, three, or four burners; and the Somzee-Greyson burner is the one that has been applied to them. For these lamps, three kinds of globes are made—porcelain, clear, or diagonal opal and flint. The four-light lamp gives approximately an illuminating power of 300 candles; and the others in proportion to the number of burners. The gas consumption of the large size is placed at 14 cubic feet. In its class, there is no doubt the lamp will be a formidable rival. The stated consumption and illuminating power show that the general construction is such as to ensure perfect combustion.

For indoor lighting, the "Veribest" inverted burner makes a handsome-looking fitting, with what is known as the combination set, which includes globe and shade. It has a special air-regulator at the top; and a bulb-shaped mixing-chamber just above the support for the mantle. In the larger size, the consumption is put at 3½ cubic feet per hour, and the lighting capacity at about 80 candles. In the "Gem" size, the consumption is 1 cubic foot; and the lighting power 25 candles.

Factory Fire Caused by Electric Wires.—Last Thursday, a fire occurred, causing damage roughly estimated at £20,000, at a Hasiingden spinning mill. The conflagration, which originated in the top storey, was caused through the fusing of some electric light wires, which were being tested. The mill was working at the time; and exciting scenes were witnessed as the 300 operatives, mainly women, made their escape. Two top storeys were utterly wrecked, and others below were damaged.

REGISTER OF PATENTS.

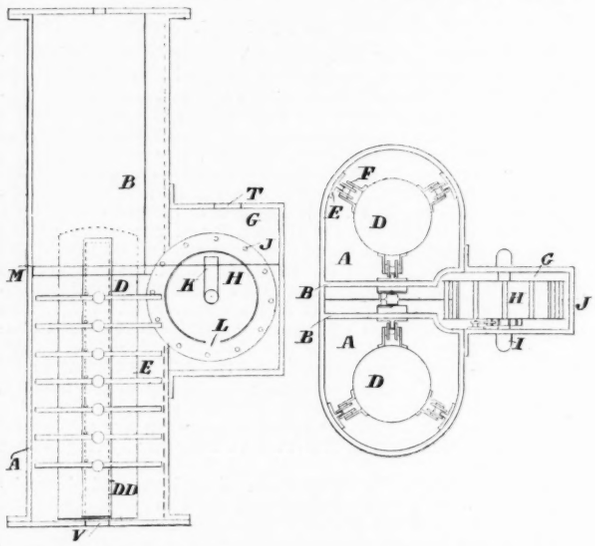
Manufacture of Gas for Illuminating, Heating, and Power Purposes, and Apparatus therefor.—Elworthy, H. S., of Dashwood House, New Broad Street, and Williamson, S., of Fenchurch Street. No. 14,333; June 25, 1904.

This invention forms the subject of an article appearing elsewhere to-day, p. 37.

Apparatus for Automatically Lighting and Extinguishing Public Gas-Lamps.—Greig, D., of Brixton, and Chandler, S. & J., of Victoria Street, S.W. No. 23,348; Oct. 29, 1904.

The object of this invention is "to provide means by which a whole district of public or other lamps can be simultaneously lighted and extinguished automatically by the temporary increase of pressure in the gas supply; the usual bye-pass or pilot light always being provided."

A is a cast-metal vessel; and B, one of two curtains which terminate low enough to seal in the liquid contained in the lower part. The line of liquid is indicated by the letter M. D are two bell-holders, with vertical guides E. F are guide-rollers attached to the bell-holders. The dotted lines inside D show the necessary stand-pipe screwed into the bottom of a vessel and rising in the centre of each bell-holder through the liquid, in order to convey the gas to the inner crown of the bell-holders. G is a drum-valve chamber bolted to the side of the vessel



A; and H is the drum-valve, which is rotated on a hollow fixed axle I, which is the gas-inlet to the drum-valve. J shows the cross-bars—12 or any given number of them forming the teeth arranged around the periphery of the drum-valve. K is a stand-pipe from the hollow axle I, which conveys the gas into the drum-valve above the liquid-line M; and L is a port in the drum-valve.

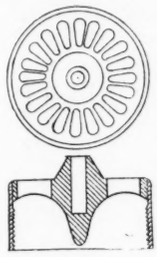
The vessel being connected to the gas-supply pipe of the lamp-column—by the gas-inlets at the bottom, both at V and I, and to the burner by the outlet at T—is charged with liquid up to the line above the hollow axle and just below the top of the stand-pipe K. At ordinary pressure, the bell-holders rest on the bottom of the vessel, and the port of the drum-valve is at the bottom submerged in the liquid. When the extra pressure is temporarily turned on at the works, the bell-holders rise and carry with them rack and hinged levers, which, in rising, engage the cross-bars of the drum-valve and cause it to slowly revolve, bringing the port of the drum-valve to the top. This allows the gas to pass on to the burner, where it is lighted by the ordinary bye-pass light. When the pressure is removed, the bell-holders slowly descend, carrying with them the rack and levers. Each of the levers makes an upward movement in passing the cross-bars of the drum-valve and again resumes its horizontal position ready for extinguishing the light when the temporary pressure is again applied from the works. The same action then takes place, which causes the drum-valve to make a half-revolution, so that the exit port of the valve is submerged and the gas supply cut off.

Gas Cooking Apparatus.—Cox, G. J., of Melbourne. No. 2291 Feb. 6, 1905.

Gas-grillers as now usually constructed, the patentee points out, are formed in cast iron and as portable apparatus; and, if sufficiently large for family requirements, they are of considerable weight—"necessitating the room and use of a substantial base." His invention is primarily for the purpose of providing grilling apparatus of capacious size, but light in structure, and such as can be fixed permanently on a vertical plane, as a wall, on the side of a fixed dresser, or on any suitable and stable structure, and thus "obviate the loss of room required for the base of a cast iron griller."

The novelty of his invention consists in forming a structure in sheet metal in such a manner that the principal portion of a grilling chamber, a support and wall attachment for the chamber, and a base for supporting dishes to be warmed, will all be formed in one piece of sheet metal, and wherein the whole structure, apart from the gas-burner and

its necessary fittings, but including a plate-warming shel for receptacle (in addition to the dish-warming base), is formed in two pieces of sheet metal, and a connecting and bearing metal bar riveted or bolted to the sheet metal.

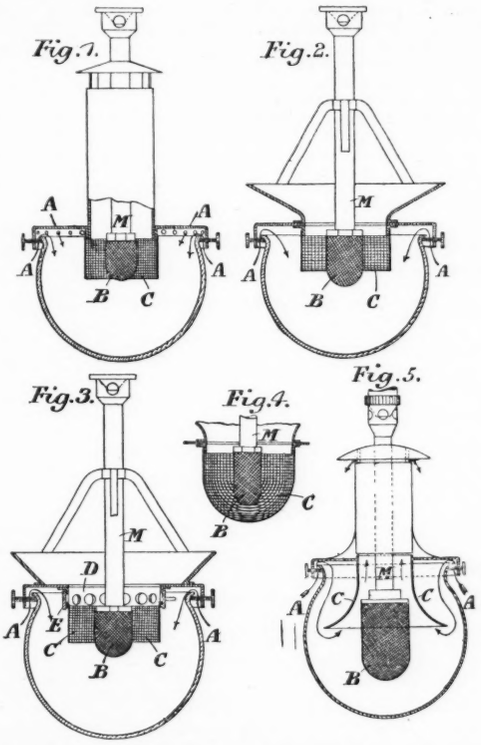


Burners for Incandescent Gas-Light.—Weickart, T. H. W., of Leipzig. No. 10,363; May 17, 1905.

This is a modification of patent No. 14,164 of 1904, and relates more particularly to the burner-head, with the object of causing the gas supplied to flow on to the periphery of the burner-head—that is, directly on to the mantle. The disc of the form shown is provided with a cone so shaped as to cause the gas to flow on to the periphery of the burner-head. To increase this outward flowing of the gas, the disc is provided with radial openings, which are wider at the outside of the burner-head than at the inside.

Inverted Incandescent Gas-Lamps.—Wolff, L., of Berlin. No. 2697; Feb. 9, 1905.

This invention is an improvement on patent No. 13,488 of 1904; and consists in providing a perforated metal mantle or casing, heated by the flame, arranged between the inlet for the external air into the lamp and the incandescent body, in order to preliminarily heat the air for combustion, and allow it to reach the incandescent body "in a preliminarily warmed condition, whereby the illuminating power of the lamp is increased."



In figs. 1 and 2, a wire-mesh screen mantle C is arranged on the lamp between the lamp-globe and the incandescent body B and attached to the lamp in any suitable manner. The fresh external air passes at A into the lamp, and enters either through holes (fig. 1) arranged in the lamp dish or through an aperture (figs. 1 and 2) left free between the globe and the dish or plate, or through both simultaneously. Apertures for the admission of the air may also be provided in the globe. The entering air, in consequence of the draught existing in the lamp, will be drawn upwards through the meshes of the mantle C, which are heated by proximity of the flame, and "is effectively warmed, which has for a consequence an increase in the illuminating power of the lamp."

In the form of construction shown in fig. 3, the screen C is attached to a sheet-metal casing D (provided with holes) round which a second regulating ring E (also provided with holes) is revolubly placed. The holes in the casing and ring serve for the admission of cold air from the inlet A to the mixing-tube M for the purpose of cooling the latter. By turning the ring E, the admission of cold air to the mixing-tube M may be regulated.

In the form of construction shown in fig. 4, the incandescent body B is entirely enclosed by a perforated mantle or sieve C, which may be made of wire screens or sheet-metal casings having larger or smaller perforations. When the air for combustion is drawn through this sieve, it "is also finely subdivided, and in consequence its heating by the heated sieve is brought about in a peculiarly uniform and intense manner."

In fig. 5, the metal casing or mantle C is prolonged downwards in a funnel-shape in order that its interior surface may also serve as a reflector. In this form, the screen or mantle then also takes the place of a reflector.

APPLICATIONS FOR LETTERS PATENT.

18,830.—KRIEGER, H., "Device for removing molten zinc from the insides of pipes." Sept. 18.
18,875.—FORD, T. & F., "Gas-fittings." Sept. 19.
18,910.—SCHOFIELD, W. B., "Gas-stoves." Sept. 19.
18,918.—MOSS, T. & W., "Meters." Sept. 19.
18,923.—REID, R., "Generating gas." Sept. 19.
18,949.—THE NEW HYGIENIC STOVE COMPANY, LTD., and GREENWOOD, E. P., "Convertible fire or stove." Sept. 20.
19,020.—HILLENBRAND, J., and KIND, R., "Utilizing the heat available in a gas-motor." Sept. 20.
19,039.—ANDERSON, J., "Automatically lighting or extinguishing a number of gas-lights simultaneously." Sept. 20.
19,048.—PROCTER, E. W., "Gas water-heaters." Sept. 21.
19,051.—WISHART, J., "Gas-engine." Sept. 21.
19,052.—THOMSON, H. K., SKINNER, W., and HAMILTON, C., "Fuel calorimeter." Sept. 21.
19,058.—BROTHERHOOD, C., "Gas-producer." Sept. 21.
19,069.—WEBB, R. H. S., "Acetylene gas-engine." Sept. 21.
19,118.—ANDERSON, D., and SCOTT-SNELL, C., "Self-intensifying gas-lamps." Sept. 21.
19,119.—ANDERSON, D., "Controlling gas-lamps." Sept. 21.
19,173.—ROSEN, N., "Acetylene generator." Sept. 22.
19,176.—MOELLER, J., "Incandescent burners." Sept. 22.
19,274.—ALBERTIS, C. DE, "Safety gas-burners." Sept. 23.
19,276.—RUUD, E., "Water-heaters." Sept. 23.

LEGAL INTELLIGENCE.

Unlawfully Disconnecting a Meter.

At Birmingham last Friday, a plumber named Hazledine, living at No. 81, Ombersley Road, was summoned for fraudulently abstracting gas belonging to the Corporation, unlawfully and improperly burning gas, and also with disconnecting the meter. Mr. Prideau, who prosecuted, said an accidental visit was paid to the house on Aug. 21. A complaint had been received by the Corporation from No. 87, Ombersley Road, but this was misread as No. 81; and the fitter and his man went there. They called at ten o'clock in the evening. The Corporation men thought that something must be wrong, for the defendant precipitately left the door and went down to the cellar. At the time an incandescent light was burning in the back room. A sound was heard as of tools being used on the meter. When the men reached the cellar, there was a smell of gas; and the meter was found disconnected. An inspector said defendant denied to him that there was an incandescent light burning in one of the rooms; but witness told him it seemed funny that after he got down into the cellar the light went out. Defendant, on the summons for disconnecting, was fined 20s. and costs; the other summonses being dismissed.

The Liability of Prepayment Meter Consumers.

At the Manchester Police Court last Thursday, before Mr. Brierley, a woman was summoned for non-payment of an account for gas consumed between December, 1904, and March, 1905. She said she was a widow, and asked for time, on the plea that her husband died in March, and that within a few days of his death her slot meter was broken into and the money it contained—some 13s. odd—stolen. The present claim included the amount stolen. She informed the police, she said, of the robbery; and they investigated it, but failed to discover the thief. The Magistrate asked the collector who appeared how the woman could be made liable. He remarked that he had an idea the gas was paid for every time a penny was placed in the slot. The collector said the gas was held not to have been paid for until the money was taken from the meter by a servant of the Corporation; and in support of this he called attention to an agreement which was signed by all users of slot meters, binding them to keep the money in safe custody until collected. The Magistrate: The husband would be liable for gas up to the date of his death. His widow would be liable only on administering to his estate. It was, however, elicited from the defendant that she was in possession of the furniture which had belonged to her husband; and the Magistrate said that this being so she must pay. After the case had been disposed of, the Magistrate expressed his opinion pretty strongly to the collector that users of slot meters ought not to be held liable after they had once put their money into the Corporation's receptacle. The collector said the question had arisen before. The present form of agreement was adopted some years ago. The Magistrate remarked that he thought it was capable of further amendment.

Regulating the Seal of Hydraulic Mains.—Mr. G. Helps, of Nuneaton, writes on the above subject, as follows: "I notice in your issue for the 19th of September particulars of a patent taken out by Mr. A. Johnston, of Ilford, for regulating the seal of hydraulic mains. I should like to point out that this is an infringement of my own patent, of which you were good enough to give particulars last year (Oct. 11, p. 115); and the natural consequences will ensue if I can discover where such a main is in use."

Increased Storage for the Tonbridge Gas Company.—Owing to the progress of the Tonbridge Gas Company, under the able direction of their Engineer and Secretary, Mr. James Donaldson, the Directors have found it necessary to increase their storage capacity, and have recently been having their No. 3 holder (erected close to the Medway) telescoped. The inauguration of the new holder, the work in connection with which has been in the hands of Messrs. C. & W. Walker, Limited, recently took place in the presence of a numerous company.

MISCELLANEOUS NEWS.

THE SALE OF THE HALIFAX TAR-WORKS.

In the "JOURNAL" for the 19th ult. (p. 764), there was published an abstract of the report of the Special Tar-Works Committee to the Halifax Town Council, which led the Corporation to determine to dispose of the plant upon terms that had been arranged. We have since received a complete copy of the report; and as it contains figures that will no doubt be found of general interest, the document is here reproduced *in extenso*.

In accordance with the resolution passed at the Council meeting on May 3, 1905, we herewith present our report upon the financial condition of the tar-works as shown on the balance-sheets for the year and nine months ending March 31 last, and the advisability of any future working of the tar-works as a municipal undertaking. The majority of the Council will, no doubt, be well aware that, ever since the first suggestion to erect tar-works was placed before the Gas Committee, there have been very varied opinions as to the ultimate financial results of such a scheme; and in order to form a just and unbiassed opinion of the future prospects of the undertaking, it is necessary to trace the whole matter through from its first inception.

It appears that in 1898 there was a prevailing opinion among the members of the Gas Committee that they were not receiving a true market price for the tar produced at the gas-works; and it was further suggested that these unfair prices were brought about by combination between respective tar distillers, who, in order to insure low prices for their raw material, allocated certain towns to respective firms, and would not then tender against each other. The final result of the Gas Committee's opinion was expressed in a recommendation to the Council on Sept. 7, 1898; and it was then decided to proceed with the erection of tar-works. Though no definite sum was stated in the resolution submitted to the Council, it was generally understood that the total cost would not exceed £8000.

As regards the question of the Committee being forced to accept unfair low prices for the tar, the following figures have been extracted for consideration by members of the Council.

Year.	Prices Quoted per Ton of Tar, as per "JOURNAL OF GAS LIGHTING."						Actual Prices Realized by the Halifax Corporation, as per Accounts.
	Highest.		Lowest.		Average.		
	s.	d.	s.	d.	s.	d.	£ s. d.
1890	32	6	22	6	28	2	Not stated in year book.
1891	32	0	19	0	26	1⅜	1 4 9
1892	20	0	8	0	11	9½	0 13 2
1893	17	0	9	0	13	1¼	0 19 3
1894	22	6	12	0	16	2	1 7 3
1895	24	0	17	0	20	0½	1 0 9
1896	28	0	17	0	21	7½	1 0 9
* 1897	21	0	13	0	17	10½	0 17 10
1898	20	0	10	0	14	4½	0 16 6
* 1899	25	6	15	6	20	8¼	1 1 10
1900	28	0	14	0	20	9	1 4 9
1901	18	0	13	6	15	11½	0 18 5
1902	26	0	15	0	19	6	1 6 1
† 1903	33	0	21	6	26	3½	1 4 2
† 1904	27	0	17	0	20	3½	1 3 4

* Calculated on half-year's prices only.
† Supplying tar to tar-works, and completed oil contracts.

The amount of capital proposed to be expended (£8000) would no doubt have considerable influence with the Gas Committee when they decided to recommend the scheme; and this Special Committee desire to strongly impress upon the Council the fact that, though to all appearances the £8000 first named was quite adequate to erect an efficient works, capable of dealing with all the tar produced at our gas-works for many years, yet the present capital expenditure on the works is £20,833.

It may be of assistance to the Council to here point out that the system of tar distillation usually adopted is the "intermittent"—or, in other words, the distillation is carried on by means of the ordinary so-called pot stills; one complete distillation being carried out in stages from the lightest to the heaviest products. These stills can be made of a suitable capacity in accordance with the amount of tar available for distillation. The system adopted at Halifax is known as the "continuous;" and the Lennard's patent continuous still was erected under the personal supervision of the patentee. By this system, a continuous flow of tar is passed through the still; and both light and heavy products are being given off at the same time, so long as the supply of tar to the still is continued.

The production of tar at our Halifax works may be taken at 4750 tons per annum, and the Lennard's still is capable of dealing with 70 to 80 tons of tar per day; so that, on the basis of (say) 75 tons per day, the still can work up in 63 days the whole of our yearly production of tar, or in twelve months (barring accidents), over 25,000 tons. A mere glance at the name of the still will at once suggest that, in order to ensure success, continuous work must be necessary; and members of the Council may readily draw their own conclusions as to the result of working any plant 63 days only out of 365. Unfortunately, however, it is not even possible to run 63 days continuously, as the storage accommodation is somewhat limited, and a continuous run of 16 days would completely fill our pitch bays. In addition to the pitch bays, the refining plant and storage cisterns are not sufficiently large to deal with the products from continuous working of the still; and, therefore, stoppage of the plant at varying intervals is unavoidable.

Under such circumstances, it is quite apparent that the best working results will not be obtained; and an examination of the balance-sheets confirms this opinion. During the nine months ending March 31, 1904, 2252 tons of tar were distilled; and the result was a net loss of £1513. During the year ending March 31, 1905, 3595 tons of tar were distilled; and the net loss was £3073—or a total loss over the 21 months of £4586. There are, however, several items in the balance-sheets (which contribute to the loss) that can scarcely be called legitimate charges against any definite period, as after they have once been paid there can be no recurrence of similar items. The following are the items—

	£	s.	d.
Two-thirds of royalty due to patentee	583	6	8
Allowance on conveyor contract	155	0	0
Interest and sinking fund during erection of works. .	748	0	0
	£1486	6	8

After allowing the above items, there still remains an actual loss of £3100 on the 21 months' working; and it must also be remembered that the cost of renewals, or wear and tear, would considerably increase as the plant became older, and, further, that the amount paid to sinking fund account has been calculated on a 40 years' basis, which is too long a period for tar-works plant.

It has been freely admitted by members of the Gas Committee that the past management has not been of the best; and a careful analysis of the balance-sheets may perhaps confirm this opinion. But the amount of loss is so large that it appears to be practically impossible for the loss to be made up by a mere change of management; hence their appeal to the Council for advice or instruction in the matter. This Special Committee have held several meetings, and gone very carefully into the question of management; but though satisfied that improvements in the financial results could certainly be obtained, they are of opinion that, under the present burden of over-capitalization, standing expenses, excess size of some parts of plant and under size of other parts of plant, heavy working costs, &c., it is far more probable that these works will never be a financial success. As a matter of fact, many members of the Committee feel that the value of the undertaking as a going concern is not more than £6000 to £7000.

The Committee were then confronted with the problem as to which was the best means of minimizing the loss to the Corporation; and, after several discussions, it was decided to invite offers for the lease of the site, buildings, plant, &c., or the lease of the site and buildings, and the sale outright of the plant and apparatus. After careful consideration of the offers, personal interviews took place with representatives of two firms of tar distillers; and as a result of these negotiations, the Committee decided to recommend to the Council the acceptance of the following offer:—

> That the Contractor pay the Corporation the sum of £6000 for the tar-still, producers, refining plant, storage cisterns, and manufacturing plant generally. That £3000 of the purchase money be paid at once. That the remaining £3000 of the purchase money be deposited with the Corporation as security; and that £300 per annum for ten years, or £3000 in all, be taken therefrom and credited to the Corporation as instalments towards the payment of the remaining purchase-money due. The Corporation to allow the Contractor the current rate of interest upon the amount or balance of money deposited with the Corporation as security. The Contractor to pay the Corporation £300 per annum, for rent of buildings and site. Such rent to be paid so long as the Contractor continues to work the plant upon the present premises; but in any case a rent of £300 per annum shall be paid for a period of not less than three years.
>
> The Corporation agree to supply the Contractor for a period of 21 years with 4000 tons of tar per annum, upon the following basis: The average of the prices quoted in the "JOURNAL OF GAS LIGHTING" shall be taken each month; and to such price shall be added an allowance of 7½ per cent. Such amended sum shall be the price charged for all tar delivered during the month previous.
>
> The above basis for ascertaining the selling price of tar shall remain in force for a period of not less than three years; but any time after such period of three years, either party may, upon giving six months' notice, ask for a revised scale or basis of ascertaining the price of tar, and failing mutual agreement upon a revised basis, then the question to be submitted to friendly arbitration. In case of any such arbitration proceedings, the claim of the Corporation to an allowance of 7½ per cent. above the average market value of tar, shall be duly safeguarded by a clause embodied in the agreement.
>
> In the event of the production of tar falling below an average of 4000 tons per annum, then for every ton below the average 4000, the Corporation shall pay or allow the Contractor one shilling—that is to say, assuming the production of tar throughout the 21 years should total up to 81,900 tons, there would be a shortage of 2100 tons, which would represent an allowance of 2100 shillings, or £105.
>
> The Corporation shall deliver the tar into the overhead tanks at the tar-works; and such overhead tanks shall be considered as the property of the Corporation. In the event of the Contractor ceasing to work the plant on the present premises, then the Corporation shall undertake to deliver the tar from the above overhead tanks into railway tank-waggons provided by the Contractor, and placed on the railway siding running into the tar-works.
>
> The Contractor shall supply the Corporation with all pitch and creosote they may require, at the prices quoted for export at East Coast ports, as per quotations stated in the weekly issues of the "JOURNAL OF GAS LIGHTING." The Contractor shall pay all rates and insurance premiums upon the plant and stock, and shall, within a period of six months, make the necessary arrangements for obtaining a steam supply, so that the tar-works may be entirely isolated from the gas-works range of steam-pipes. The Corporation shall provide the Contractor with steam for a period not exceeding six months, and such supply shall be paid for on the basis of actual cost to the Corporation.

In placing this report before you, it is not to be understood that every member of the Special Committee is in favour of the recommendation to discontinue working the tar-works; but every member has expressed a decided opinion that the works have cost too much, and are certainly not worth anything approaching their book value. There is a further unanimous opinion that, though the works are heavily over-capitalized, the plant is ill-adapted for economic working in works the size of those at Halifax, and that whatever course is pursued the Council must be prepared to accept a heavy loss.

The opinion of the minority of the Committee is that the works

should again be run under new management; and, if the Lennard's still is unsuitable for our Halifax works, to discard the "continuous" system and erect an installation of "intermittent" or pot stills. The Council should, however, bear carefully in mind that this suggestion would eventually lead to further capital expenditure; and no figures have been brought forward to prove that the works would then be remunerative.

In conclusion, it may be stated that, after a careful consideration of the matter in every detail, a majority of the Committee feel convinced that the tar-works can be more profitably worked by private enterprise, and that it will eventually be to the interests of the Corporation to dispose of the plant, and make the first loss the last and the least.

THE GAS EXHIBITION AT NEWCASTLE-ON-TYNE.

The comprehensive and instructive exhibition promoted by the Newcastle and Gateshead Gas Company continued last week to draw large crowds to the Exhibition Hall; and great interest was manifested in the many useful and novel exhibits. The attendance up to Friday last totalled to about 28,000; and we learn that the amount of business being done by the Company and the exhibitors is eminently satisfactory. The working portions of the exhibition have all commanded the attention of numbers of visitors—one of the chief and most curious attractions being the stand upon which the hatching of eggs and the forcing of lily-of-the-valley crowns by means of gas are carried on. The apparatus or incubator containing the eggs has hatched out chickens daily since the commencement of the exhibition. After allowing a certain time to elapse, Miss Edith Sanderson, the exhibitor of the incubator, transfers the chicks to a "brooder," where a large number, strong and healthy, are running about picking up food themselves. The forcing of lilies excites much wonderment, as the generally accepted idea is that gas is injurious to plants. They are growing in a miniature summer-house heated by gas; and the small spikes which just appeared above the soil at the opening of the exhibition were at the close of last week fine leaves about 9 inches high, beautiful in form and tint, with a goodly show of buds about to burst into flower. The Ramie Company's exhibit is an object of much attraction, as the knitting, cutting, stitching, and burning-off processes in the manufacture of mantles for incandescent lighting is fully demonstrated. A baker's and pastry-cook's stand in full operation has been a great success; the productions—ranging from scones to wedding cakes—being quickly disposed of. The working kitchen and laundry have each been of great interest; the demonstrations carried on therein being keenly followed.

Not the least attractive feature of the exhibition was the competition in cookery among the girls of the elementary schools of Newcastle. The competitors, who were between the ages of 12 and 15 years, numbered 31; and they were selected by the mistresses of the various schools. In groups of four they prepared, cooked, and served one dish—fish in batter, jam tartlets, liver and bacon, or rock cakes—and marks were awarded, not only on the result of the cooking, but for cleanliness, speed, economy, and method of working. Four complete sets of utensils were provided, and each girl did everything in connection with her dish, except the weighing out of the ingredients; and it is unnecessary to say that the operations were followed each night by an interested group of elders. The number entering was reduced by preliminary competitions, and last Saturday night the final was held; those who took part in it being the girls who had secured the maximum number of marks in the second round. For the final competition, each girl was required to prepare and serve a small breakfast, consisting of scones, toast, bacon, eggs, hot milk, and coffee; and she was allowed for it more time than was given for the preparation of the dishes previously mentioned. The first prize was awarded to Jane Henderson (13), the second to Elizabeth Humble (12), and the third to Mary Clemmy (13). The food cooked by the competitors was on exhibition each evening; and the work spoke well for the training which is being carried out in the cookery schools of the city. Miss Adelaide Redford, of the Northern School of Cookery, was the Judge; and her decision was final. Prizes of the following values will be awarded from the Company's show-room: First, £5; second, £3; third, £1 10s.; four of 5s. each; and one of 2s. 6d. Each prize winner will in addition receive a diploma. The exhibition will close to-morrow.

THE PRICE OF GAS TO MANUFACTURERS.

Opinions at Coventry and Birmingham.

The proposal of the Gas Committee of the Coventry City Council to reduce the price of gas for motive power (which was referred to in last week's "JOURNAL," p. 834) came before the Council at their recent meeting, and, being received with much opposition, was referred back to the Committee for further consideration. Alderman Booth, the Chairman of the Committee, submitted as the principal argument in favour of the reduction that it was necessary to meet the competition that had sprung up in the shape of suction-gas plants. Mr. Batchelor, in seconding, pointed out that the large consumers used a quarter of the gas made at the works. Mr. Hanson regarded the principle as wrong that one consumer should be charged 1s. 6d. per 1000 cubic feet of gas, and another 2s. 6d. Alderman Andrews was also a strong opponent, and described the policy as financially unsound. He advised the Committee not to be afraid of large consumers making their own gas if they wanted to. Alderman Kinder informed the Council that the Committee were by no means unanimous in making the recommendation. He took the view that everyone who used gas should bear his proportion of the cost. Mr. Randle favoured the revision of charges, but suggested that the recommendation should be referred back. Alderman West, Chairman of the Electric Light Committee, urged that the latter Committee would be expected to reduce their charges for current for motive power; while Mr. Bettmann wanted the small consumer to have some benefit from any reduction that might be made. Mr Jackson, the Vice-Chairman of the Gas Committee, thought the matter should stand over until it was seen what the cost of making gas at the new works at Foleshill was likely to be; and Mr. Lee complained that the gas undertaking, with its large turnover, yielded so little for the relief of the rates of the city. The recommendation was referred back.

The question of the price of gas charged to manufacturers has also been raised at Birmingham, in connection with the report of the Directors of the James Cycle Company. This document contains the following remarks: "It will be advisable to put down a gas plant in consequence of the high price charged by the City of Birmingham for gas supplied for manufacturing purposes. The Directors consider that this ought not to be necessary, because the Company are supposed to be well situated for manufacturing purposes; but they feel some doubt on this point when the city makes a charge of 1s. 10d. per 1000 cubic feet, whereas the following towns can supply it as under: Widnes, 1s.; Sheffield, 1s. 2d.; West Bromwich, 1s. 5d.; Nottingham, Leicester, Lancaster, and Plymouth, 1s. 6d.; Oldbury, Darlington, and St. Helens, 1s. 8d.; and Glasgow, Bury, and Derby, 1s. 9d. per 1000 cubic feet. At Smethwick and Coventry, it is expected that it will shortly be reduced to 1s. 6d. per 1000 cubic feet." The importance of the matter thus raised led a representative of the "Birmingham Daily Mail" to interview Mr. G. Hampton Barber, the Secretary of the Gas Department, on the subject. Mr. Barber said he had challenged the Chairman of the Company to produce guaranteed figures showing that they could manufacture gas cheaper than the city sold it. There was reason to believe, Mr. Barber continued, that the expectations which the makers of the small producer plants held out were not invariably supported by actual results. Birmingham gas was claimed to possess a calorific value four times greater than that which would be produced by a suction-gas plant. This plant had been freely criticized; and one of its critics recently went so far as to say that the plant, however useful in places where town gas was not available, could be of no advantage within an area where the latter was supplied at a reasonable cost. This was, of course, the point of the whole matter. The Birmingham Gas Department naturally contended that their price of 1s. 10d. per 1000 cubic feet, less 5 per cent. discount, was reasonable, having regard to all the circumstances. Some towns where gas was cheaper were better situated geographically, being nearer the sources of the best coal for the purpose; while in other places where the price was less than in Birmingham there were rental charges for meters and other such incidental circumstances which, when allowance was made for the quality of the gas, made up the difference. "Still," adds our contemporary, "the fact remains that the makers of the gas-producer plants are finding a number of people ready to be persuaded into having them. Mr. Barber, however, said he would be pleased to discuss the question of comparative cost with anyone who was thinking of setting up a producer plant; and he was satisfied he could show that it would not be advantageous to make the change."

Mr. Barber's remarks on the subject called forth the following letter, signed "Manufacturer," which appeared in the "Birmingham Post" on Saturday: "The Secretary of the Corporation Gas Department does not perhaps know that if a manufacturer can get the horse power he requires out of his engine, or engines, at a reduced weekly charge of generally 50 per cent., and in some cases 75 per cent., it is a matter of perfect indifference what is the calorific value of the gas. It is certain that the time is approaching when the burden of making the largest portion of the profit on the Gas Department will be removed from the overloaded backs of the manufacturers who use the gas for power; and, having to face competition, the price for power gas will have to be greatly reduced by the Gas Committee. This will mean either that ordinary consumers' prices will go higher or the profits will suffer. I have been carefully studying the question of putting down a gas plant for the last three years, waiting for its perfection; and I intend doing so very shortly, for the following reasons: I use approximately 30,000 feet of gas per week for power at the present time. Up till the 15th of this month [September], this cost me 2s. per 1000 feet less 5 per cent. for cash. This represents 57s. per week net. With my own plant, I can produce the same brake horse power as I am obtaining now for a cost of 20s. per week. Added to this there will be 2s. 6d. per week extra wages to the man who will run the plant. This makes 22s. 6d. per week; and I will allow another 2s. 6d. per week dead charges on cost of plant, which is £150. The rough total is now 25s. per week; and I will allow another 5s. per week to meet any possible contingencies. This still gives me a balance in favour of my own plant of 27s. per week, or a saving of £70 per annum. Granted that I shall find that the brake horse power of my engine will be reduced from 15 to 20 per cent. owing to my gas not being as good quality as the town supply, still anyone with a good margin over their maximum load has nothing to fear. Finally, there is no doubt that 'gas plants' are here to stay; and if the Gas Committee had wished to retain their largest customers, they should have reduced the prices in proportion to the quantity consumed, instead of bringing large and small consumers down to a common basis of 1s. 10d. per 1000 feet—the result being that the large consumer, previously paying 2s., obtains a concession of 2d. per 1000 feet, while his small competitor round the corner, who was previously paying 2s. 6d. per 1000 feet, obtains a reduction of 8d. Surely this is inverse to every ordinary course of business, where if one gave a concession of 8d. to a small buyer, the large ones would certainly, buying three or four times the quantity, expect and obtain a reduction of at least 1s."

Exmouth Gas Company.—The report presented at the half-yearly meeting of the Exmouth Gas Company last week set forth that the working of the undertaking had been very satisfactory during this period. Mr. J. Palmer, who presided, remarked that the coal used during the half year cost £2080, or £131 less than in the corresponding period last year, while the quantity of gas manufactured was 29,970,700 cubic feet, or an increase of 896,000 cubic feet. The total expenditure had been £3768; and the balance carried to the profit and loss account was £1143. This was slightly less than last year, and was due to a reduction of 2d. in the price of gas. The report was adopted.

DEVONPORT CORPORATION GAS-WORKS.

The Erection of the Carburetted Water-Gas Plant.

A definite beginning with the erection of the much-discussed carburetted water-gas plant was made at the Devonport Gas-Works yesterday week, when Alderman W. Hornbrook, the Chairman of the Gas Committee, laid the foundation stone of the building which is to contain the apparatus. Those present comprised the members of the Gas Committee and the principal officials of the Corporation.

The foundations have been put in under the supervision of Mr. J. W. Buckley, the Engineer, and the building and plant are to be erected by Messrs. S. Cutler and Sons. The buildings will be of steel; and the plant will comprise, in addition to the apparatus for manufacturing water gas, coke elevating and conveying machinery and the necessary oil-tanks, boilers, station meter, &c. Messrs. Cutler's contract amounts to £8185; and they have engaged to have the plant in working order by November.

Mr. BUCKLEY explained that the plant would comprise two complete sets, each capable of making 400,000 cubic feet of water gas per day. Each set could be worked separately or jointly, so that when operated together they would manufacture 800,000 cubic feet in 24 hours. This would give an increased manufacturing power to the works of 50 per cent. It was an indisputable fact that the manufacturing capacity of the works was very much below what it ought to be; and he believed the Committee would prove that they were well advised in carrying out this important extension. In deciding to adopt carburetted water gas, they had followed in the footsteps of many who had shown their wisdom from a manufacturing and economic point of view. Similar plant was working very successfully in some of the most popular health resorts of the country; and he hoped Devonport would feel that its adoption was a step in the right direction. On the previous Saturday, they had sent out a quantity of gas 20 per cent. in excess of the united capacity of the present holders. This showed the great importance of getting the new holder completed by the earliest possible date. It would, however, not be in perfect order for working this winter; and there would be a very anxious time for the Chairman and himself in keeping the town supplied with gas, especially if the Contractors should not be able to get the water-gas plant fully equipped as they had promised. In conclusion, Mr. Buckley asked the Chairman of the Committee to lay the foundation stone to mark the date of the structure.

Alderman HORNBROOK, responding to the invitation with very great pleasure, remarked that they were carrying out the behests of the Town Council. It was a surprising thing, in face of all the contentious matter they had had, that the Council, by a practically unanimous vote, accepted the recommendation of the Gas Committee. It said very much for the good judgment of the Council that, when they had gone to the trouble of making every inquiry of independent men, who could have no possible interest in the matter, they had accepted that which the Committee thoroughly believed to be the best system of producing water gas. He was sure that when another twelve months had passed, they would be confirmed in the conviction which they had that day, that they were in the right hands. Their Engineer had impressed them already. When they entered the gateway and looked over the yard, they witnessed a transformation scene. Few would have believed that such a thing was possible. In addition to their confidence in the Engineer, they were encouraged by the fact that they had Contractors who had the very highest reputation in England. Long before the Committee had decided what to do, Sir Joseph Bellamy, the Chairman of the Plymouth and Stonehouse Gas Company, said to him: "If you want to have the thing done thoroughly well, you cannot do better than follow our example. Cutlers are people on whom you can rely. We relied on them. We knew scarcely anything. We placed ourselves in their hands; and we have never regretted it. I am sure you will not regret it." That was the character they received of the firm when, as a deputation, they were inquiring into the different systems of water-gas manufacture. On the present contract, there would be no extras amounting to hundreds of pounds, and no delay. Before this year was out, Mr. Buckley and himself—if he was still Chairman of the Committee—would have the pleasure of inviting, not only the members of the Committee and the heads of departments, but the whole Corporation, to come and see what they had done. He would also ask the ratepayers of Devonport to carefully consider the result of the first two years' working, and say whether they had not worked in the best interests of the town. The foundation stone which the hammer and chisel had wrought out of rude and rough block, and which presented a polished and clean face, was a fitting emblem of the object, motive, and purpose of the Committee. He hoped there would be no more recrimination. Let the dead past bury its dead. Let that foundation represent the firmness of their mind, conviction, and purpose to do all they could in the interests of the town. Mr. Hornbrook then laid the stone, using an ordinary trowel. Commenting upon this, he said that, as a Committee, they could not afford a silver trowel; but he hoped the Committee would let him keep the trowel he was using in commemoration of the event.

At the conclusion of the ceremony, Alderman Hornbrook invited the company to a light luncheon.

Mr. E. M. LEEST, the Vice-Chairman of the Committee, proposed the health of Alderman Hornbrook and the thanks of the Committee to him for laying the foundation stone. From what he had heard from Mr. Buckley, he was confident the plant would be a success; and provided they kept Alderman Hornbrook as Chairman, he saw no reason why the undertaking should not be of great advantage to the town.

Alderman HORNBROOK, in reply, spoke of his interest in the concern, and said he had consulted scores of engineers privately, and in advising the Committee had acted upon the information which he had gained. The impression that the Gas Committee were always at sixes and sevens was erroneous. As a whole, the Committee were most loyal to the Chairman and to the town. This was a very pleasant day to him; and he hoped a month or two later they would be able to inaugurate an installation equal to any which could be found in the length and breadth of the land. When they had it, their Engineer would at once start to save hundreds of pounds a year. He was already saving them money in all directions, and given two years, they would be justified in the eyes of the people of Devonport for every step they had taken.

The TOWN CLERK (Mr. R. J. Fittall) said that, though he was not an engineer, the consensus of opinion given him was that there was only one system of water-gas manufacture—namely, the carburetted system—which was well tried, and that could be relied upon to give good results. When the installation was in working order, the Committee would find that they had done the right thing in adopting it; and he hoped it would lead to the anticipated saving of money.

Mr. BUCKLEY, in replying to the toast of his health, said that one of the inducements to him to come to Devonport was that he knew there would be a great deal of work to be done. During the last three months, he had proved that beyond measure.

The company then separated.

BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. H. B. Chamberlain) read the notice convening the meeting, as well as the report of the Directors, together with—in pursuance of the Act of Parliament—the Norwich accounts. The report was as follows:—

The Directors submit the half-yearly accounts of the Company to June 30 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £24,822 5s., after deducting (excluding shillings and pence) the following sums: Income-tax, £1733; Hull debenture interest, £2137; Norwich debenture interest, £1130; Potteries debenture interest, £665; Trowbridge debenture interest, £166; and interest on debenture stock, £2280—total, £8113.

HULL—The gas-rental shows a decrease of £279, as compared with that of the corresponding period of 1904; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows a decrease of £1073; tar and tar distilling, of £1236; and ammoniacal liquor and sulphate of ammonia, of £1127. Coals have cost 12s. 2d. per ton, as against 12s. 5d. Coke has realized 10s. 8d. per ton, as against 11s. 8d.

The gas sent out was 556,214,000 cubic feet, against 575,175,000 cubic feet in the corresponding period of 1904—a decrease of 18,961,000 cubic feet, and equal to 3·29 per cent. Of this quantity, 44,589,000 cubic feet was supplied in bulk to the Corporation for the supply of the old town.

The profit realized, after writing off £3500 on account of reconstruction of No. 1 retort-house and coal-store, is £363 less than the parliamentary interest. This sum will be taken from the reserve fund; leaving a balance of £31,183 to the credit of that account.

NORWICH—The gas-rental shows a decrease of £694, as compared with that of the corresponding period of 1904; the price of gas having been the same—viz., 3s. 3d. per 1000 cubic feet. Coke shows a decrease of £142; and tar and ammoniacal liquor, an increase of £505. Coals have cost 15s. 8d. per ton, against 17s. 4d. Coke has realized 8s. 5d. per chaldron, against 8s. 7d. The gas sent out was 225,840,000 cubic feet, as against 229,007,000 cubic feet—a decrease of 3,167,000 cubic feet, equal to 1·38 per cent.

The profit realized, after writing off £4100 on account of reconstruction of works and offices, is £3339 less than the parliamentary interest.

POTTERIES—The gas-rental shows a decrease of £1149, as compared with that of the corresponding period of 1904; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. Coke shows a decrease of £812; and tar of £474. Ammoniacal liquor and sulphate show an increase of £466. Coals have cost 10s. 8d., against 11s. 7d. per ton. Coke has realized 6s. 11d., against 7s. 5d. per ton.

The gas sent out was 186,167,000 cubic feet, against 196,167,000 cubic feet—a decrease of 10,000,000 cubic feet, equal to 5·09 per cent.

The profit realized, after writing off £5000 on account of buildings and plant thrown out of use, is £4774 less than the parliamentary interest. This sum will be taken from the reserve fund; leaving a balance of £16,951.

TROWBRIDGE—The gas-rental shows a decrease of £40, as compared with that of the corresponding period of 1904; the price of gas having been reduced from the 1st of April, 1905, from 3s. 2d. to 3s. per 1000 cubic feet with the usual discounts. Coke shows a decrease of £194; and tar, ammoniacal liquor, and sulphate, of £130. Coals have cost 15s. 3d., against 15s. 4d. per ton. Coke realized 9s. 5d., against 11s. 5d. per ton.

The gas sent out was 33,385,000 cubic feet, against 33,114,100 cubic feet—an increase of 270,900 cubic feet, equal to 0·81 per cent.

The profit realized is £295 less than the parliamentary interest. This sum will be taken from the reserve fund; leaving a balance of £1379.

HOLYWELL—The gas-rental shows a decrease of £97; and residual products, of £17. The profit realized is £404.

The available profit added to the previous balance of profit and loss amounts to £58,810. From this sum the Directors recommend a dividend at the rate of 10 per cent. per annum, free of income-tax. This will amount to £24,500, and leave a balance of £32,488 11s. 2d.

The Directors who go out of office are Mr. J. Horsley Palmer and Mr. Frederick Wilkin; and the Auditors are Mr. Edward Yardley and Mr. E. Knowles Corrie. They respectively offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report, said when the shareholders met together six months ago, he went very fully into the matters connected with the Company, more especially with regard to the works of reconstruction that had been, and were being, carried out at the three most important stations of Hull, Norwich, and the Potteries. Therefore, in moving the adoption of the report and accounts on this occasion, he did not intend to detain the shareholders very long, because he thought it would be quite unnecessary to repeat all he said six months ago. There were, however, one or two points which it would be requisite to speak to them about. The first was that he considered they could congratulate themselves on the way in which the new shares were so readily taken up by the proprietors. He must confess that he had, in his own mind, some doubts as to whether the shareholders would not think that the price of £40 was an exceedingly high one for the new shares; but he was very pleased indeed to find that they saw what an excellent investment it was, and readily took up the whole of the 1500 shares, so that the outside public were not able to get any at all. The other matter which he wished to refer to particularly was the decrease in the consumption of gas at their principal stations. It

was the first time in the history of the Company, so far as he had been able to trace, that the Chairman had to report that there had been a diminution in the quantity of gas sent out generally over the workings of the half year. But they must take into consideration that there had been, especially during the winter quarter—that was to say, the three months from December to Easter—a considerable amount of depression at the stations. In going closely into the figures, they found that the greater portion of decrease which was reported in the Directors' report took place during these three months. Going further into the matter, he found it permeated all classes of the consumers. It was not simply that manufacturers shut down their works, but they found that even the smallest consumers on the slot-meter system had also shown a general shrinkage in their consumption. This was only, he supposed, owing to the bad times that had been existing in Hull and Norwich, and especially in the Potteries. There was no doubt about it that the trade in the Potteries had been in a very bad state; and, he was sorry to say, still continued in that condition. But he did not look upon this small decrease as likely to influence the future of the Company in any way. He had quite sufficient faith, not only in the stability of the Company, but in the way in which they managed their affairs, and the way in which their Engineers and agents worked for them in the towns. They, too, thought this was only a passing phase in the business, which would clear away as soon as matters got better in these towns in regard to business. With respect to the actual work that had been done during the half year, he had only to report, in addition to the work at the three principal stations, that at the Trowbridge station they had completed the new settings of retorts; and there and at the other stations they had, of course, gone on with their usual operations. The increase at Hull in meters fixed had been considerable, as well as at Norwich, and also, to a less degree, at the Potteries. With regard to the Norwich station (upon which a very interesting account had appeared in the last two numbers of the "JOURNAL OF GAS LIGHTING," and which he strongly recommended all the shareholders in the Company to read), they had benefited very greatly by the expenditure of capital which the Directors had incurred during the last three years. To such an extent had it benefited them, that they were within a very few pounds of earning their parliamentary interest; but in accordance with the determination the Directors made some time ago, and which he explained at the last two meetings of the shareholders, they had devoted £4000 of these profits to partly writing off the cost of the new works. One matter in the report he wished to allude to—namely, the decrease of £1127 in the sulphate of ammonia at Hull, because everyone connected with sulphate knew the price had been very fair during the past six months. This was accounted for by the fact that they had made more water gas during the six months, and that therefore they carbonized less coal. He really did not think he had anything more to say to the shareholders. They had been able, by their earning powers at the different stations, to increase the profit sufficiently to pay, not only the dividend on the old shares, but also that on the 1500 shares which they had newly issued—and which, he might point out, they only received the benefit of at the end of last May, while the shareholders were receiving the full half-year's dividend to June 30.

Mr. FREDERICK WILKIN seconded the motion, and it was carried.

On the proposition of the CHAIRMAN, seconded by Major-General W. T. CORRIE, a dividend at the rate of 20s. per share, clear of income-tax, was declared.

Mr. CORBET WOODALL, in a few complimentary, but well deserved, remarks as to the Chairman's assiduity in looking after the affairs of the Company, moved that gentleman's re-election to the Board.

Mr. WILKIN seconded the motion; and it was unanimously carried.

The CHAIRMAN having acknowledged the continued confidence of the shareholders,

Major-General CORRIE proposed, and Mr. R. S. GARDINER seconded, the re-election of Mr. F. Wilkin.

Mr. STEVENS proposed the re-election of Mr. Edward Yardley, one of the retiring Auditors; and Mr. B. F. HARRIS having seconded the motion, it was unanimously agreed to.

On the motion of Mr. MACKAY, seconded by Mr. LONGDON, Mr. Knowles Corrie, the other retiring Auditor, was also re-appointed.

Mr. HARRIS, in moving a vote of thanks to the Chairman and Directors for their able management of the business of the Company, said he thoroughly endorsed all the Chairman had said about the new issue of shares. It was indeed greatly to the credit of the Directors that there were so many who wanted the shares, and yet could not get them, notwithstanding the price they were issued at.

Mr. STEVENS seconded the motion; and it was unanimously carried.

The CHAIRMAN, in acknowledging the vote, referred to the paucity of shareholders present, in spite of the fact that the Company had no less than 1610 on their books. He was afraid that the proprietors did not take much interest in the affairs of the concern other than the receiving of their half-yearly dividends.

Mr. CORBET WOODALL said it was his privilege to propose that the thanks of the shareholders be given to the Secretary and the other officers of the Company. It was not easy to find fresh words in which to propose this resolution. Everybody knew—they all knew—how well the Company were served; but there were some things, like charming old stories, that were worth telling over again, although the sentiment or message was the same. Whatever might have been said of the gas industry in the past, it could not be said now that it was supported by privilege or monopoly. They had to fight for their business against sturdy competitors in almost every branch. There was hardly an application of gas in which they had not to face more or less serious rivalry. He thought it followed, therefore, that their officers could not afford to remain simply what their predecessors were. He was speaking now of their Engineers at the stations. They had to be none the less capable engineers; but they had, at the same time, to be scientists in a degree not known to their forefathers, and they had also to be keen men of business. They wanted good officers; and he thought they could say with great confidence that they had them. It was his pleasure to move that a message of confidence should be sent to them all.

Mr. R. S. GARDINER seconded the motion, which was carried.

The SECRETARY, on behalf of himself and his fellow officers, briefly replied; and this concluded the business of the meeting.

ILFORD GAS COMPANY.

In moving the adoption of the report and accounts for the half year ended June 30 at the recent meeting of the Ilford Gas Company, the Chairman, Mr. W. Ashmole, said that it was particularly gratifying to note that, notwithstanding the extreme mildness of the past winter, which could not fail to adversely affect the sale of gas, and the reduction made to consumers from Christmas of 2d. per 1000 cubic feet, the revenue from this source was nearly £700 in excess of the amount received for the corresponding half of last year. The effect of climatic conditions upon the output was undoubtedly great; and a much smaller volume of gas was required to satisfy the demands of consumers, both for lighting and heating purposes, in consequence of the mild weather, than would have been the case had less favourable conditions prevailed. This, together with the rapidly extending use of the more economical incandescent burner, accounted largely for the percentage increase shown in the sale of gas being smaller than formerly; but an increase of nearly 11 million cubic feet in the volume of gas sold as compared with the corresponding half of last year might be considered extremely satisfactory. With regard to incandescent lighting, it was, in the opinion of the Board, of the greatest importance that consumers should be placed in possession of the most efficient and economical means of using gas. No effort was therefore spared by the Company's staff to induce consumers to abandon obsolete forms of lighting and heating, and, by the adoption of modern methods, to effect economies which at first sight appeared to be contrary to, or not to run parallel with, the interests of the Company, but were, in fact, the only sound and solid basis upon which an undertaking such as theirs can attain permanent success. With a view to still further popularizing the use of gas for domestic purposes, and following the example of most of the London and Suburban Companies, a scheme was being initiated whereby gas heating-stoves might be obtained on hire from the Company at low rates; thus placing within the reach of all a cleanly, convenient, and economical method of heating. As, however, they did not wish to spend more capital than was absolutely necessary, the Board decided for the present to limit the expenditure. The erection of new offices and show-rooms in the High Street had been commenced; and when they were completed, greater opportunity would be afforded for the effective display of the many and varied forms of gas apparatus used in providing light, heat, and power. Favourable coal contracts had been entered into for the ensuing year; and the position as regarded raw materials generally was rather better than was the case last year. The cost of production, it was anticipated, would be materially reduced; and when he informed them that there was only one London Company whose labour charges were at present lower than their own, they would, he thought, agree that the position of the Company in this respect was a very favourable one. The revenue showed a satifactory condition of affairs; the balance carried to profit and loss account exceeding that of last year. Though the production of gas in 1905 was greater than that of 1904 by 11¼ million cubic feet, the cost of manufacture was actually less. Raw materials cost more by £140, and purification also showed an increase; but a saving of nearly £100 had been effected in the item of wages, and repairs cost less by £150. This gratifying feature of the account was due partially to the more favourable coal contracts entered into, but mainly to the improved carbonization methods adopted at the works, yielding a marked increase in the production of gas per ton of coal. In this respect, again, they were able to challenge comparison with many companies more favourably situated. Distribution also showed improvement; but the evergrowing item of rates and taxes had increased by more than £200. This charge now represented nearly 2d. per 1000 cubic feet of gas sold. On the other side of the account, gas returned £673 more than in 1904, in spite of the reduction of 2d. per 1000 feet. In common with other companies, the receipts from coke were not so good as last year. This was mainly due to indifferent trade, and the mildness of the winter season.

The report and accounts were adopted, the usual dividends were declared, and votes of thanks were accorded to the Chairman and Directors and the Engineer (Mr. A. A. Johnston) and staff.

Subsequently, an extraordinary general meeting was held, at which the Directors were authorized to raise further capital to the extent of £40,000, to be issued from time to time to meet the requirements of the Company's increasing business and for working capital.

LEEDS GAS WORKERS AND THE UNEMPLOYED.

It may be remembered that the Leeds Corporation Gas Committee, with the object of finding work for about 120 more men than are now employed, suggested that the present staff should agree to work six days per week instead of seven; one of the days, if necessary, to be a Sunday, for which the usual rate of wages—viz., a day-and-a-half, should be paid. A ballot of the men was taken on the subject. They were asked if they would give the Committee's recommendation a trial of three months, provided they had a definite assurance that at the end of this time they could revert to the present conditions if desired; or, on the other hand, whether they would press their claims for a six-day week, not to include Sunday. The ballot resulted as follows: For pressing the claims, 524; for a trial of the Committee's proposal, 51. The decision of the men creates a serious situation. The Gas Committee met on Tuesday, when, among other matters, they had under consideration this refusal of the men to accept the proposal for a re-arrangement of their working hours. It was resolved to ask the gas workers to agree to the whole question of the men working six days a week being submitted to the Leeds Conciliation Board for settlement. The Board, it may be mentioned, is constituted of representatives of the Chamber of Commerce and the Trades Council.

The Directors of the River Plate Gas Company, Limited, have declared an interim dividend at the rate of 6s. per share, free of tax, for the half year ended June 30.

GAS, ELECTRICITY, AND WATER SUPPLY AT LEICESTER.

Mr. Colson's Naphthalene Remedy.

At their Quarterly Meeting, last Tuesday, the Leicester Town Council had submitted to them the half-yearly reports of the Gas, Electricity, and Water Committees.

Mr. Edwards, in moving the adoption of the report relating to the Gas Department, remarked that the outstanding capital was now £1,100,365. The revenue account showed that, by the sale of gas, they received £107,777—a decrease of £1626 as compared with the corresponding period of last year. Rental of stoves was £1493, or an increase of £33; coke and breeze, £14,692, a decrease of £7506; and tar and ammoniacal liquor, £13,753, or a decrease of £1577—a total decrease of £9083 from residual products. The entire revenue was £138,667, or a decrease of £10,323. On the other side, the manufacture of gas cost £41,667 for coal, a decrease of £6259; oil and coke for water gas showed a decrease of £813; wages for carbonization amounted to £9192, or a decrease of £2413; repairs and maintenance to £10,448, or a decrease of £2002; and other expenses brought the total to £65,582, or a decrease of £11,106. Distribution of gas cost £13,974, or a decrease of £1398; rents and taxes, £6150, or an increase of £130; management expenses, £3213, or an increase of £276. The total expenditure was £89,086, leaving them to carry to profit and loss account £49,581, or an increase of £1942. Three small items brought the total to £50,283. Of this, £19,498 was taken for interest, and £7260 for sinking fund, which left them with a clear net profit of £23,524, an increase of £1520 on the corresponding period of last year. The balance-sheet was a most remarkable one. It was very rarely they had to report a decrease in the income from the consumption of gas. He took it that the consumption of gas was a true index of the state of the trade of the town. If the trade of the town was good, and factories working full time, instead of closing at dusk, they would have had an increase instead of a decrease. He hoped the time was not far distant when this state of things would obtain. The decrease in the sales of residuals, too, was something phenomenal. On the other hand, they had saved very considerably in the manufacture of gas. They had saved £6259 in coal, and £813 in oil and coke. This saving had been almost entirely due to the naphthalene difficulty being removed by Mr. Colson's invention. He stated a year ago that Mr. Colson said he expected they would save £5000 a year. It had reached considerably more than this; for in the past six months they had made a saving of £6283, which was a total of £12,566 for the year. During the three years, 1901-2-3, they had 58,504 stoppages in the town. During the past twelve months in the district served by the Aylestone Road works not a single stoppage had occurred, and in the district supplied from the Belgrave Gate works, where the washing process was only put into operation in June last, a few isolated cases only were reported—averaging one per day, and one week two daily. But even in this district the nuisance was practically a thing of the past. The retort-house wages had been considerably influenced by the process, and the saving of no less than £1445 had been effected during the last six months. The larger yield of gas per ton of coal also represented a most substantial sum, as no less than 10,980 cubic feet per ton had been sold and paid for during the past half year. The Committee had decided, subject to the approval of the Council, to put £5000 of the profits of this half year to the reserve fund, which now stood at £8000. If they had any great calamity in the works, they would have to go to revenue; and they thought the time had arrived when they could afford to increase the reserve fund, and the £5000 was a very modest sum to put to the fund. They did not know what the next half year would bring them. They had promised £20,000 towards the year's profits. He thought they would be pretty certain to make this; but they did not expect to make such a great profit in the coming half year as in the past.

The motion having been formally seconded, the report was adopted without discussion.

Mr. Edwards next dealt with the electricity undertaking; the outstanding capital of which he said was £220,334. The revenue for the half year was: Sale of current, £14,339—increase, £393; rental of stores, £676—increase, £76; the total revenue being £15,119. The generation of electric light cost £2917—a decrease of £12; distribution, £673—increase, £93; management, £735—increase, £5. The total expenditure was £5509, leaving them with a profit of £9610, or an increase of £366 on the corresponding period of last year. They took £3697 for interest on capital, and £3343 to the sinking fund; and this left them with a net profit of £2623. This, added to the profit they already had in hand, would amount to £15,172. The Council decided six months ago that the new machinery and plant they were now putting in should be paid for out of the profits, rather than that further capital should be expended. When the new plant was fixed, it would absorb £12,000 or £13,000 of these profits, leaving them about £2000 in hand. The department was still progressing; and they hoped that when the new machinery now being placed in their station was completed, they would have plant sufficient to meet all demands for a very long time to come.

When the motion for the adoption of the report had been seconded, several questions were asked.

Mr. Edwards, in reply, said that depreciation was taken in some respects very largely, and in other respects scarcely at all, because to do so would practically mean the establishment of two sinking funds. With regard to meter-rents for electric light, the Committee would abolish them when they could afford it. As to the reserve fund, he hoped that after the new machinery was put in and paid for the profits of the Electric Light Department would for some years be put to a reserve fund, until it reached £25,000 or £30,000.

The motion was agreed to.

Mr. Biggs, in the absence of Alderman Wood, moved the adoption of the Water Committee's report. He was afraid it was not of so glowing a character as the one submitted by the Gas Committee; but perhaps it was equally important. Unfortunately, owing to the diminished water supply, there was a decrease in the revenue, side by side with an increased expenditure. The net profits of £7584 this year were less by £1240 than those of last year. The cutting off of the water each night and turning on again each morning involved additional wages amounting to over £400; and there were other expenses attributable to the same cause—the net increase of expenditure during the year being £830, while there was also a net decrease of income of £410. Much had been said from time to time with regard to the seriously low condition of the reservoirs. The cause of this, as they knew, was the decreased rainfall. Up to date, the rainfall in the reservoir districts had been about 5 inches less than up to the same date last year. Not only had the fall been very inadequate, but it had taken place in such driblets that even the rain they had had did not give the same benefit to the reservoirs as it had done in previous years. Some doubt had been expressed as to whether any beneficial effect had followed the curtailment of the water supply. The returns placed before the Committee from time to time showed conclusively how effective had been the restrictive measures. In January last, the consumption of water was 20 gallons per head per day; but for the last six months, while the water had been cut off during the night, the consumption had gone down to an average of 15½ gallons per head per day. Altogether there was now a saving of something like 1¼ million gallons per day, so that the Committee were perfectly justified in taking the steps they did. The present position was much the same as on Sept. 18, when the Committee met. They had now only 60 days' supply of water, as compared with 160 days' supply at this time last year. It was earnestly desired that the public should continue to exercise the same economy that they had practised during the past six months, because unless there was a considerable rainfall very shortly the position of the town would indeed be much more serious than it had ever been in previous years. Not since the water supply was instituted in 1854 had the town been in the same straits as it was to-day with regard to its water supply.

Dr. Bryan seconded the adoption of the report.

Mr. J. T. Hincks again protested against the water profits being placed to the Derwent sinking fund, for the benefit of their children or their great-grandchildren. They were doing all they could to reduce the consumption of water, and at the same time placing £7000 to a reserve fund for the benefit of their grandchildren.

Alderman Vincent said the money they were saving in this way would not be for the benefit of their great-grandchildren, or even their own children. In four years from now they would have to fall back upon this fund and begin to spend it; and it certainly would not last them above four years. They would have to find interest and sinking fund upon a million-and-a-half of money; and this would mean £65,000 a year. Unless they had this reserve fund to fall back upon, they would have to go on the rates at once. When the fund was exhausted, they would have to take £40,000 or £50,000 a year from the rates.

Dr. Davies asked the amount of the Derwent reserve fund at the present time, and how it was invested.

Mr. Biggs, replying, said the amount of the reserve fund, when the £7000 referred to in the report was added, would be £93,248. He could not say at the moment how it was invested.

After some further discussion, the report was approved.

FATAL BOILER EXPLOSION ON A GAS-WORKS.

Shocking Occurrence at Longridge.

The Longridge Gas-Works, near Preston, were last Thursday morning the scene of a dreadful accident, resulting in the deaths of John Bamber, a stoker, and John Ormerod, a painter and plumber, and the serious injury of Mr. H. Lancaster, the Manager. Shortly after nine o'clock, a boiler situated in the open yard, and which was used to provide steam for the making of sulphate of ammonia, exploded. Rushing out of the retort-house to discover what had happened, a labourer named Woodward encountered a huge cloud of smoke, while bricks seemed to be falling in all directions. Knowing Bamber and Mr. Lancaster were in the vicinity of the accident, he went in search, and was just in time to see the latter near a gas-holder in the act of falling. Mr. Lancaster was suffering from a severe cut on the face, but just managed to ask for "something to do him good," when he became unconscious. He was removed to a place of safety, and subsequently taken to the Preston Infirmary, where the latest reports show him to be making satisfactory progress. While Mr. Lancaster was receiving attention, Woodward went to find Bamber; and afterwards recovered his body from the water in the holder, into which he had been thrown by the force of the explosion. Noticing a strange cap, he continued his search, and in a few moments recovered Ormerod from the same place. Both men were dead. The front of the boiler was blown against the holder, causing a large hole, which allowed the gas to escape. The boiler itself dashed through a substantial stone wall, and, entering a field, ploughed it up for a considerable distance.

The inquest was opened on Friday, when Mr. Ascroft, who represented the Gas Company, expressed the sympathy of the Chairman and Directors with the widows and families of the deceased. The first witness called was Mrs. Bamber, who said her husband had been employed as a stoker at the works for about three months. Mrs. Ormerod also identified the body of her husband. Woodward explained what he saw at the time of the accident; and then the inquiry was adjourned till next Monday, for the taking of scientific evidence. The Foreman, on behalf of the Jury, expressed deep regret at the occurrence, and pointed out that Ormerod was not at the gas-works as an employee. He was engaged in connecting some service-pipes for the Council, which necessitated his attendance at the works.

At the last meeting of the Liversedge Urban Council, it was reported that a scheme was to be submitted with a view to the improved lighting of the district by means of the incandescent system.

ROCHDALE AND LEEDS GAS COAL CONTRACTS.

The Gas Committee of the Rochdale Corporation have just settled their coal contracts for the coming year. The orders have been placed with five firms; the total quantity to be supplied being about 60,000 tons, or 2000 or 3000 tons more than last year. The Committee have obtained their coal at a reduction of 2d. per ton, which means a saving of £500. The Leeds Gas Committee have had before them the tenders for the supply of gas coal. It has been usual to let contracts for twelve months; but last year they were let for fifteen months, and on the present occasion it was decided to provide for eighteen months' supply. This course was adopted in consequence of the present low price, and the probability that by the end of the period named coal will become dearer. The quantity offered was about 1,200,000 tons, which is four times the amount the Committee will require. It was agreed to accept tenders for about 300,000 tons, for delivery up to June 30, 1907. The coal is to be obtained from between twenty and thirty different firms. The prices agreed upon, which, of course, vary according to the different qualities of the coal, are slightly lower than those which are being paid under existing contracts.

BOLTON CORPORATION GAS SUPPLY.

Depreciation on Gas Cooking-Stoves.

Mr. Alfred Pilling, C.A., one of the Borough Elective Auditors for Bolton, has forwarded to the Finance Committee his first annual report and criticism of the Corporation accounts for the year ended the 31st of March. The following extract relates to the gas undertaking.

The gross profit for the year is the highest, with one exception, since the gas-works were acquired. The steady growth of capital account in recent years, and the consequent increase in the sinking fund and interest charges, are, however, affecting the net profit very considerably; this being more than £7000 less than the previous year. A very noticeable fact is that the revenue from the sale of gas is declining, due largely to the growth of electric lighting and the incandescent system. The reserve fund has been almost extinguished, owing to the necessity of providing for a special loss for depreciation on cooking and heating apparatus of no less than £5422. In these circumstances, the increasing of the contribution in aid of the rates by £6000 over the sum originally proposed seems imprudent, as the amount is obviously appropriated at the expense of the renewals fund. Notwithstanding the declining revenue, a reduced net profit, and the abnormal lowness of the renewals fund, the amount handed over to the rates is the highest since 1899. I would respectfully suggest that the policy of depleting renewal and depreciation funds in order to afford temporary relief to rates is unwise, and in the end is bound to adversely affect the profit-earning capacity of the undertaking, and in this way to cause an eventual loss to the rates of a nature more or less permanent. Special reference should be made to the depreciation on the cooking and heating apparatus. A re-valuation on this portion of the assets shows that a book value of £11,342 has had to be reduced to £5920, or over 50 per cent.; thus showing a shortage in depreciation in previous years of £5422. That an asset of this nature should require to be written down in one year at such a rate is a matter for adverse comment, as it is obvious that for many years the results of this department have been seriously misstated. The balance-sheet may be referred to briefly. The capital assets stand at £740,316. It should be noted that this amount is the cost price of the assets, and includes a sum of £229,150 for goodwill. Depreciation is provided for by the operation of the sinking and loan repayment funds, and by the amount set aside for the extinction of debt in addition to the sum required for these funds. This last item amounted at March 31 last to £94,000; and as the amount accumulated in the sinking and loan funds was £97,710, a total of £191,710 is given, which is the real reserve against the capital outlay. I am of opinion that in this, as in all the Corporation undertakings, credit should be taken in the departmental accounts for the amounts paid into the sinking and loans fund, with interest added. The inclusion of these sums in the departmental balance-sheets would show more correctly the true position. The Treasurer has been good enough to approve the suggestion, and I would suggest that the Committee adopt this modification in future.

GAS SUPPLY AT THE ANTIPODES.

In previous issues of the "JOURNAL," particulars have been given in regard to the working of some of the gas undertakings on the other side of the globe. The reports of three others have since come to hand, and may be shortly noticed.

The Brisbane Gas Company had a revenue of £20,966 from the sale of gas, &c., in the six months ending the 30th of June; and with the balance brought forward, a sum of £24,781 stood to the credit of the revenue account. The expenditure on the manufacture of gas, the allowance for depreciation, &c., came to £10,656; the general reserve fund was increased by £1500; and the reserve funds for the renewal of the holders and retort-beds by £350. This left a balance of £12,274 15s., which was disposed of as follows: Dividend of 5 per cent., £7000; bonus of 9d. per share, £1050; dividend tax, £402 10s. —total, £8452 10s.; leaving £3822 5s. to be carried forward.

At the last half-yearly general meeting of the Hobart Gas Company, the Directors reported a sum of £6326 standing to the credit of the profit and loss account, less £500 the debit on the electric light account; leaving £5826. From this the Directors recommended the payment of a dividend of 16s. per share, amounting to £4400; and making allowance for the dividend tax and the reserve fund, £720—leaving £705 to be carried forward. The Chairman (Mr. J. Hamilton), in moving the adoption of the report, stated that in the period covered by it there had been an increase in the sales of gas, though not so large as they would desire. With a view to extending the use of gas during the day time, the Board recognized the importance of charging a reduced price to customers using gas for cooking and heating purposes; while to those supplied with gas for motive power a reduction equal to about 1s. 3d. per 1000 cubic feet would be made forthwith. A difficulty had arisen in the City Council over the lighting contract; but, after considerable correspondence, a campromise was agreed to, and a contract for four years accepted as from the 1st of January next. Under it the Company were to supply 67 additional gas-lamps and 10 electric arc lamps. Through the courtesy of the Directors of the Metropolitan Gas Company of Melbourne, the Board were enabled to obtain the services of their Assistant-Engineer (Mr. P. C. Holmes Hunt) to advise them as to how best to turn their crude gas liquor to profitable account; and at the same time to report on the carbonizing plant, and the system of supply generally. On Mr. Hunt's advice, the Board had ordered a concentrating gas liquor plant, which would cost, erected complete, about £500. The profit on the sales of the concentrated liquor they were assured would meet the capital cost within a few years. Following up Mr. Hunt's recommendations, the Board would require to spend a considerable sum in making certain alterations and improvements to the carbonizing portion of the plant, and also in laying down a second trunk main. The motion was carried unanimously.

The 45th half-yearly report of the North Shore (Sydney) Gas Company, covering the six months ending the 30th of June, sets forth that orders had been placed in England for the supply of an installation of inclined retorts and a coal breaker and conveyors, and that some of the material had been delivered. The erection of the new plant will be supervised by the Engineer and Manager (Mr. T. O. Morland). The net profit on the sales of gas, &c., after allowing for reserve and depreciation, at the close of the half year was £4846, to which the balance of £31 was added, making £4877. The Directors recommended a dividend of 3½ per cent. for the half year, free of income-tax, amounting to £4812, and leaving £65 to be carried forward.

GAS AT A CAPE INDUSTRIAL EXHIBITION.

Fine Show by the South African Lighting Association.

On the last day of August, there was opened in the Feather Market Hall, Port Elizabeth, a Trades and Industrial Exhibition, in furtherance of the work of the local Young Men's Christian Association. It afforded an opportunity for Mr. W. Arnott, the energetic Manager at the Cape of the South African Lighting Association, to show what gas could do in the way of lighting and cooking, with the result that he was successful not only in obtaining the lighting of all the stalls in the exhibition, but in instituting a series of cookery competitions, which proved particularly attractive. At the Company's stall were to be seen various kinds of burners fitted to brackets of artistic designs; and the effect produced was very brilliant. Considerable interest was shown in the "Bijou" incandescent burner, the remarkable illuminating power of which surprised most of the visitors. At a small stall there was an instructive exhibit by Mr. Arnott of different kinds of coal from all over the world, including the Transvaal, the Orange River Colony, and the Cape; also a specimen of the much-talked-of oil shales from the Loerie River. The colours, medicinal products, and other bye-products of coal tar were also exhibited. On the organ platform the Association had a display of gas-stoves, with which the cookery competitions were carried on. They comprised breakfast preparation for gentlemen, scone and pancake making, &c.; and they were all carried out under the supervision of Mr. Arnott.

ELECTRIC LIGHT FAILURES.

Last Tuesday night, at about eight o'clock, owing to a short circuit in one of the mains, the electric lights throughout Llandudo suddenly failed. On the short circuit developing, there were immense flames from the dynamo running in the power house, and some of the services in the shops flashed for a moment with intense radiance, until the burning of the fuses cut off the current. The engines at the station were stopped; and not much damage beyond what occurred to the contacts was done. A concert in progress at the Pavilion was not greatly interrupted, as the alternative gas installation was brought into operation. At the Grand Theatre the acting had to be carried on with the illumination obtained from the big sun gas-burner above the auditorium; and at the Prince's Theatre the stage was lit with some large candles for footlights. All the shops, hotels, and residences depending upon electric light had also to take to candles. On the preceding Friday evening, the electric light failed at Reading over the eastern district for a period of about half-an-hour, with the result that great inconvenience was caused to the public. A service was being held in one of the churches at the time; and a resort had to be made to candles, by the aid of which the Lessons were read.

Gas v. Electricity for Public Libraries.—Last Tuesday the Libraries Committee of the Greenwich Borough Council reported that they had had before them the question of the lighting of the Central Library, now being erected. Having received a quotation from the Electric Light Company for supplying current at 3¼d. per unit, and having had from the South Metropolitan Gas Company a specification and estimate for gas-fittings, they had come to the conclusion that a very large saving would be effected by putting in gas rather than the electric light. They had accordingly given instructions to their Architect to arrange for lighting by gas, and had chosen fittings which they believed would be suitable for the purpose.

THE WATER SUPPLY OF EDINBURGH.

The Talla Scheme Inaugurated.

On Thursday last, the inauguration ceremony took place in connection with the Talla scheme for augmenting the water supply of Edinburgh and district. In 1822, the newly-formed Edinburgh Water Company introduced into the city the waters of the Crawley Spring and Glencorse Burn, and later a number of reservoirs were constructed by the Company, forming the Pentland Water-Works, from which a daily supply of 7,300,000 gallons of water is still obtained. The Water Trust was formed in 1869 to take over the undertaking of the Company. Very shortly afterwards the Trust promoted the Moorfoot scheme of water supply, which was sanctioned by Parliament in 1874, and from which there is derived about 8 million gallons daily. A larger quantity of water was anticipated from the Moorfoots than was found to be obtainable; and accordingly, as early as 1888, it began to be seen that it would be necessary to procure a further supply of water. A memorandum by the Engineers of the Trust (Messrs. J. & A. Leslie and Reid, of Edinburgh) brought the matter before the Trustees, who ordered reports to be submitted to them upon available sources of supply, including the Manor Water, St. Mary's Loch, the Talla, and the Tweed. The Engineers having reported, a further remit was made to them to consider the subject, along with Messrs. J. M. Gale, G. H. Hill, and (the late) James Mansergh. When the joint report of these gentlemen was presented, in 1891, it was found they recommended the Manor scheme, from which the estimated yield was 15 million gallons per day. The Manor scheme was almost adopted; but it was ultimately set aside in favour of the Talla or Tweed scheme, which has just been carried to completion.

An Act of Parliament authorizing the work was passed, without opposition, in 1895. One of the merits of the scheme is its possibility of expansion. Thus, the portion which has as yet been proceeded with is that which takes in the waters of the Talla and Gamshope streams only. The gathering-ground of the Talla extends to 6180 acres, or nearly 10 square miles. Almost the whole of this area, which is mainly hill pasture, has been acquired, at a cost of £36,000, by the Trustees, who thereby possess the power of preserving the purity of the water. According to observations extending over six years, the available rainfall is 38 inches per annum, in ordinary dry years. This will yield 14,598,000 gallons of water per day, one-third of which is required for compensation; leaving available a daily supply of over 9,500,000 gallons. A reservoir has been constructed at Talla, which has a surface area of about 300 acres, and a total capacity of 2800 million gallons. The greatest depth is 80 feet; and the length of the loch is about 2⅔ miles. The top line of the reservoir is at a level of 950 feet above Ordnance datum. Should it ever be necessary to bring in more water, this can be accomplished by taking in the streams Menzion and Fruid. A reservoir, with a capacity of 1837 million gallons, can be constructed on the Fruid, with a tunnel connecting it with the Talla, and taking up the waters of the Menzion by the way. The Fruid reservoir would be at a height of 1016 feet above Ordnance datum. A further extension can be effected by constructing a third reservoir upon the River Tweed itself, the contents of which would be wholly devoted to compensation purposes, for which it would serve the whole scheme, bringing up the total quantity of water drawn from the Tweed Valley to 24 million gallons daily. This third reservoir would be at a height of 1012 feet, would have a maximum depth of 98 feet, a surface area of 233 acres, and a capacity of 2510 million gallons.

Having settled upon the Tweed scheme, the first consideration was given to the carriage of materials. For one thing, clay was not procurable in the district, and had to be fetched from Carluke, in Lanarkshire, a distance of more than 30 miles. It was therefore decided to lay down an ordinary railway between the Caledonian Railway Company's station at Broughton and the site of the reservoir at Talla. At the time this decision was come to, there was a talk of a through railway being constructed between Newcastle and Glasgow; and this short section in the Talla Valley was spoken of as forming part of it. This railway scheme did not go on; but the Water Trustees constructed their railway, at an expenditure of 2½ years of time and a cost of £64,000. Now that the water-works are finished, the railway will be practically of no use to the Trustees; and unless it be acquired by some other body, it will in all likelihood be allowed to fall into desuetude. When the railway was approaching completion, the contract for the construction of the reservoir was let; and some of the contracts for making the pipe-track were let about the same time.

Prior to the construction of the embankment of the reservoir, it was necessary to make provision for the disposal of flood water. This was done by the driving of a tunnel 400 yards long through the hillside past the end of the embankment. In this tunnel are laid two 36-inch diameter cast-iron pipes, for the carriage of the supply and compensation water; and the shafts which were employed in the construction of the tunnel have been utilized as accesses to the valves which regulate the supplies. The embankment is 350 yards long. Its greatest width at the base is 600 feet, and it tapers to a width of 20 feet at the top. Its greatest height is about 90 feet above the natural surface of the ground. In the puddle trench alone about 80,000 cubic yards of clay were used. With a trifling exception, the whole of the other materials employed in the embankment were found within the reservoir. There is a waste weir channel, 200 feet in length, narrowing to a width of 40 feet where it joins the old Talla stream, near the outlet end of the tunnel. There are three levels at which water may be drawn off, each controlled by a 24-inch valve worked by hydraulic power, the pressure for which is obtained from water stored in a tank 550 feet above the top-water level of the reservoir. Provision for working these valves by hand has also been made.

The total length of aqueduct between the reservoir and the filter-beds at Alnwickhill, near Edinburgh, is about 35 miles. Of this distance, about 9 miles are in tunnel, 12 miles in cut-and-cover, and the remainder is in cast-iron pipes varying from 36 to 27 inches in diameter, according to the fall. The tunnels and built aqueducts have been constructed to carry 20 million gallons per day; the cast-iron pipes to carry 10 million gallons per day only. There are 21 tunnels, the shortest of which is 133 yards, and the longest 1⅛ miles in length. The materials through which the tunnels were driven varied from hard rock—mainly greywacke—in the tunnels to the south of Broughton, to sand and clay in those in the Pencuik district, one of which latter was driven with the aid of compressed air, without a shield. The best progress made, in the hard rock, was about 48 yards per month. The whole of the tunnels have been lined either with cement concrete or with brickwork and cement. It was the intention, at an early stage, to leave considerable portions of the tunnels unlined; but it was found that the rock was too porous to allow of this being done. The built aqueduct has mainly a gradient of 1 in 4000. The least dimensions inside the lining are 6 feet wide by 7 ft. 6 in. high.

Nearly fifty contracts in all were entered into. The construction of the railway was completed by Messrs. James Young and Sons, of Edinburgh, and the same firm had made some progress with the reservoir when Mr. Young, the senior member of the firm, died. The contract was taken up by Mr. John Best, of Edinburgh and Leith, who had already in hand several contracts for the aqueduct, extending to about 14 miles in length. Messrs. Robert M'Alpine and Sons, of Glasgow, constructed about 10 miles of the aqueduct. Cast-iron pipes were obtained from Messrs. Cochrane, Grove, and Co., of Middlesbrough; Messrs. Macfarlane, Strang, and Co., of Glasgow; Messrs. R. Laidlaw and Son, of Glasgow; Messrs. D. Y. Stewart and Co., of Glasgow; and Messrs. R. Maclaren and Co., of Glasgow. Messrs. Glenfield and Kennedy, of Kilmarnock, supplied and erected the upstand-pipes at the inner and outer shafts at the reservoir, and automatic and ordinary valves and sluices connected with the aqueduct.

The works were designed by Mr. Alex. Leslie and Mr. R. C. Reid. Both of these gentlemen died within a very short period; and the carrying on of the work fell into the hands of Mr. James Wilson, formerly of Greenock, and latterly of the firm of Messrs. J. & A. Leslie and Reid, of Edinburgh. Mr. Wilson also died while the work was in progress; and it has been completed under the supervision of Mr. W. A. Tait, of the same firm. Messrs. Gale and Mansergh, who were consulted at the initiation of the scheme, have also both been removed by death.

The work was estimated to cost £750,000; but the outlay has amounted to £1,143,220—the great amount of the difference being largely due to scarcity of labour. The expenditure was made up thus: Parliamentary expenses, £8120; heritable properties, £70,975; wayleaves, £12,535; surface damages, £7899; general expenses, £20,668; railway, £64,957; pipe-track, £658,150; reservoir, £236,183; and percentages retained on contracts, £63,727. The financial side of the scheme has been under the supervision and direction of Mr. W. Anderson, the Treasurer to the Trust, whose arrangements have been so framed that, notwithstanding the enormous outlay, the domestic water-rate, which was 8d. per pound in 1870, is now only 6½d. The work was begun on Sept. 28, 1895; and it has thus taken exactly ten years from the cutting of the first sod to the supply of the water.

As to the water itself, it was reported upon by Dr. E. Frankland, of London, in 1870, as follows, expressed in parts per 100,000: Total solid impurity, 4·02; organic carbon, 0·105; organic nitrogen, 0·017 ammonia, 0·002; nitrogen as nitrates and nitrites, 0; total combined nitrogen, 0·019; previous sewage or animal contamination, 0; chlorine, 0·63; hardness (temporary, 0·61; permanent, 1 67), 2·28. No further analysis has as yet been published.

For the opening ceremony, a party of about 500 persons were conveyed in two special trains to the side of the reservoir. There the Very Rev. Dr. Macgregor, of Edinburgh, conducted a short religious service, after which Lord Provost Sir Robert Cranston addressed the company on the benefits which are to be derived from the new water supply. Then Lady Cranston, by pressing an electric button, opened the valve upon the supply-pipe, and the water flowed into the measuring house, where it was sampled by some of the visitors. After this, Mrs. Mackie, wife of Provost Mackie, of Leith, turned on the compensation water. Both ladies were presented by Mr. Tait, on behalf of the Engineers and Contractors, with gold bracelets, set in rubies and diamonds.

The company were entertained at dinner in a large tent which had been erected on the ground. Sir Robert Cranston presided. Letters of apology for absence were read from the Prime Minister, the Marquis of Linlithgow, Lord Balfour of Burleigh, and the Earl of Wemyss. Mr. T. Wood, ex-Provost of Portobello, who has been a member of the Water Trust since its creation in 1869, in the name of the Trustees presented Sir Robert Cranston with a silver bowl, and Provost Mackie with a silver cigar-box, upon both of which were engraved a view of the new works. The toast of "The Edinburgh and District Water Trust, and Success to the New Undertaking," was proposed by Sir Walter Thorburn, M.P.; that of "The Engineers and Contractors," by Sir Andrew M'Donald, of Edinburgh—the latter being replied to by Mr. Tait and Mr. John Best, jun. In the evening, the Trust entertained, in the Royal Hotel, Penicuik, 85 of the workmen who have recently been employed upon the scheme.

The water reached Alnwickhill on Friday morning. The Talla aqueduct, in point of fact, terminates a mile before reaching Alnwickhill, by being introduced into the Moorfoot main; and thus the two waters mingle before they come to the filtering-ponds.

Assessment of the Birmingham and Rochdale Water-Works.—The Birmingham Overseers recently held a special meeting for the purpose of considering the appeal of the Corporation against the assessment of the water undertaking in the Parish of Birmingham. Mr. Antony Lees, Secretary to the Water Department, and Mr. W. Mason, Surveyor, attended, and placed the matter before the Overseers from the point of view of the Corporation. After the subject had been debated, it was decided to reduce the rateable value from £28,000 odd to £15,000 odd—practically a reduction of £13,000. The Rochdale Corporation have successfully appealed against the assessment of the Ramsden Wood Water-Works, which are within the borough of Todmorden. The appeal came before the Todmorden Assessment Committee last week, and was supported by Mr. W. H. Hickson, the Town Clerk. Consideration having been given to all the facts of the case, the Committee agreed to reduce the assessment from £1000 to £400.

NEW RIVER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held on Thursday at the Finsbury Town Hall—Mr. HENRY C. B. BOWLES (the Governor) in the chair.

The SECRETARY (Mr. H. Stoddard) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The GOVERNOR, in moving the adoption of the report, said there was no need for him to go into the history of the old New River Company. No doubt most of the shareholders had either heard or read of how Sir Hugh Myddelton, some 300 years ago, brought water to London. He obtained at that time a Royal Charter, under which he worked, and under which the Company had worked ever since up to the time that their undertaking was acquired. The Board had hoped that this Charter would have stood the Company in good stead when they came to be bought out. In 1902, an Act of Parliament was passed creating the Metropolitan Water Board for the purpose of taking over the works of the Water Companies; and if they could not do so by agreement, they were to go to arbitration on the matter. The Act provided for an Arbitration Court, of which Sir Edward Fry was Chairman. Unfortunately, when it came to the crucial point, which, in their case, was whether they were unlimited in respect of dividends or were limited to 10 per cent., the Arbitrators gave a decision which was adverse to the Company. The case was taken to the Appeal Court, where three eminent judges were unanimous in the Company's favour. The Water Board carried the matter to the House of Lords, and he regretted to say that, of four Law Lords, only one—the Lord Chancellor—was in their favour. It was a most unfortunate result for the shareholders. In 1904, according to the Act of 1902, the Company had to go to Parliament for an Act to enable them to carry on and manage their landed estate; and the present Company took over the land which was not transferred to the Water Board. The gross income was now about £9877, derived from ground-rents, rack-rents, and interest on invested sums; and the net income available for dividends, reserve fund, &c., might be estimated at £7277 per annum. This would be largely increased in the near future by the falling-in of the leases of the Clerkenwell Estate. There were in addition some 158 houses, &c., in Middlesex, let at ground-rents amounting to £915 per annum, the leases of which fell in between 1927 and 1996. The Company also owned about 380 acres of agricultural and meadow land in Middlesex and Hertfordshire, of which 137 acres at Wood Green and Enfield and 54 at Cheshunt would, it was hoped, become available for building purposes.

The DEPUTY-GOVERNOR (Sir Joseph Savory) seconded the motion.

Mr. GOODE asked at what price the water stock was awarded to the New River shareholders. He noticed that the report stated that "each of these amounts"—referring to the distribution of the £6,500,000 of water stock in the proportions directed by the order of the Court of Arbitration—"has been divided rateably among the shareholders of the respective classes, but subject, in the Adventurer's and King's classes, to the several charges affecting the individual holdings, as required by the New River Company's Act, 1904." What he wanted to know was whether the stock which he held, representing a part of a King's share, was subject to any charge, and, if so, of what kind.

Mr. BENNETT stated that he held part of an Adventurer's share which was formerly worth £4360, but by the sale of the undertaking its value had been reduced to £2847, so that he had lost £1513. He wished to have some explanation of this wholesale reduction. He had received from the Secretary a letter on the subject in which he explained that the Court of Arbitration had given effect to the decision of the House of Lords that the Company were prohibited from paying dividends in excess of 10 per cent. on their nominal capital. He (Mr. Bennett) contended that this was no real explanation.

Several other shareholders asked questions in regard to the accounts.

The GOVERNOR, replying to the various points raised, said the award to the Company was on a different basis from that made in the case of the other Companies. The Act of Parliament provided that the New River Company should be paid in stock, but the other Companies were paid in cash. With regard to the loss that one shareholder had complained about on his Adventurer's share, it must be borne in mind that the Company were paying a dividend of 12¾ per cent.; and no doubt the purchase was made on this basis. Unfortunately, the Court decided that the dividend was limited to 10 per cent. There were 36 King's shares and 36 Adventurers' shares.

Mr. GOODE asked if each King's share was entitled to one thirty-sixth of the £2,445,527 mentioned in the report.

The GOVERNOR said that was so, subject to certain charges. Some of the King's shares had to bear the Crown "clog" (land-tax not redeemed), and so on.

The SOLICITOR (Sir John Hollams) stated that the New River Company in 1852 fixed their capital at £1,519,000, he thought. Afterwards it was increased by the issue of new shares to the extent of £500,000. Consequently, on a division, the new shares took £500,000. The balance, which gave the figure mentioned in the report, was the sum for the King's and the Adventurers' shares. But some of these two classes of shares had for all time been subject to the "clog"—the £400 a year paid to the Crown when the King gave up his moiety of the undertaking. This contribution was paid in unequal proportions by certain of the owners of the shares; and consequently there was a fractional difference in the amount awarded in respect of each share.

The GOVERNOR, in the course of some further remarks, stated that the Directors would be eventually reduced to seven. He thought they might hope to pay a dividend of 5 per cent. on the £1 shares to begin with, and as the leases fell in they might hope that this amount would be increased. Unless something unforeseen occurred, he did not think there would be any occasion to issue any of the unissued shares of the Company.

The motion was unanimously adopted.

It was afterwards resolved that, until otherwise ordered, the remuneration of the Directors should be fixed at a sum equal to 5 per cent. on the amount actually distributed as dividend.

A resolution was passed appointing Mr. A. R. Pennefather, C.B., as Auditor till the next general meeting; and it was further decided that the annual general meetings of the Company in future should be held on the first Thursday in July.

The Lanchester Parish Council have been informed by the Rural District Council that they are considering the lighting of the village with gas.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 36.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 13	10½	Alliance & Dublin 10 p.c.	22—23	+½	4 11 4
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	May 12	6¼	Bombay, Ltd. . . .	6¾—7¼	+¼	4 9 8
140,000	5	,,	6¼	Do. New, £4 paid	5—5¾	..	4 14 6
50,000	10	Aug. 31	14	Bourne- mouth Gas and Water } 10 p.c. . .	29—30	..	4 13 4
251,810	10	,,	7	Do. B 7 p.c. .	16¼—17½	..	4 0 0
53,200	10	,,	6	Do. Pref. 6 p.c.	15⅛—16½	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	250—255	..	4 18 1
300,000	,,	,,	9⅜	Do. New . . .	190—195	..	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	June 15	4	Do. 4 p.c. Deb. .	103—106	..	3 15 6
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8¼	Do. A. Ord. Stk. .	160—165	..	5 0 0
460,000	20	Sept. 28	10	British	42½—43½*	..	4 11 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c. .	119—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	89—93	..	4 16 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd.	12¾—13¼	..	5 5 8
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
150,000	20	July 13	6¾	Cagliari, Ltd. . . .	24—26	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½*	+½	5 14 3
100,000	10	Apl. 28	4½	Do. 4½ p.c Pref. .	10¾—10⅞	..	4 3 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	102—104	..	4 6 7
1,400,000	Stk.	Aug. 31	5 5/16	Commercial 4 p.c Stk. .	117—120	..	4 6 8
560,000	,,	,,	5	Do. 3½ p.c. do. .	113—115	..	4 6 11
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	87—89	..	3 7 5
800,000	Stk.	,,	6	Continental Union, Ltd.	119—122	+1	4 18 4
200,000	,,	,,	7	Do. 7 p c Pref.	137—142	..	4 18 7
424,070	Stk.	—	1½	Derby Con. Stk. . . .	124—126	..	4 7 4
55,000	,,	June 3	4	Do. Deb. Stk. . .	108—110	..	3 12 9
486,090	10	July 28	11	European, Ltd. . . .	22½—23½	..	4 13 7
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,223,235	Stk.	Aug. 16	4 1/10	Gas- light and Coke } 4 p.c. Ord. . .	99—100	..	4 8 0
2,600,000	,,	,,	3½	3½ p.c. max. . .	91—93	−1	3 15 3
3,799,735	,,	,,	4	4 p.c. Con. Pref.	109—112	..	3 11 5
4,193,975	,,	June 15	3	3 p.c Con. Deb.	88—90	..	3 6 8
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	98—101	..	4 19 0
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	19½—20½	+⅛	5 7 4
3,800,000	Stk.	May 12	10	Imperial Continental .	219—222	+1	4 10 1
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	122—127	−3	4 14 6
561,000	Stk.	Aug. 16	10	Liverpool United A . .	226—228	+2	4 7 9
718,100	,,	,,	7	Do. do. B . .	168—170	..	4 2 4
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	111—113	..	3 10 10
75,000	5	,,	5	Malta & Medn., Ltd. .	4¼—4⅝	..	5 5 3
560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb. .	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 31	3½	Monte Video, Ltd. . .	11½—12½	..	5 12 0
1,565,892	Stk.	July 29	4⅝	Newc'tle & G'tesh'd Con.	106—107	..	4 6 5
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	18½—19½	..	5 2 7
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	145—148	..	5 8 1
600,000	5	Sept. 14	7	Ottoman, Ltd. . . .	6—6½	..	6 7 8
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord. . . .	6¾—7¼	+½	4 2 9
796,980	5	July 28	5	Do. 5 p.c. Pref. .	5¼—5⅝	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
851,070	10	Apl. 28	7	River Plate Ord. . . .	13½—14	+½	5 0 0
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Sept. 28	7	San Paulo, Ltd. . . .	13—13½*	+¼	5 3 8
70,000	50	July 1	5	Do. 5 p.c. Deb. .	51—53	..	4 14 4
135,000	Stk.	Sept. 14	10	Sheffield A	235—235	..	4 5 1
209,984	,,	,,	10	Do. B	233—235	..	4 5 1
523,498	,,	,,	10	Do. C	233—235	..	4 5 1
126,106	Stk.	Aug. 31	5½	Shrewsbury Ord. 5 p.c.	104—106	..	5 3 9
70,000	10	Sept. 28	10	South African	15½—16½*	..	6 1 3
6,250,000	Stk.	Aug. 16	5½	South Met., 4 p.c. Ord.	132—134	..	4 2 1
1,895,445	,,	July 13	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Aug. 16	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
112,533	,,	July 13	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	May 12	5	Southampton Ord. . .	111—114	..	4 7 9
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham } A 5 p.c. .	122—125	..	5 0 0
363,720	,,	,,	4¾	and } B 3½ p.c. .	96—99	..	4 16 0
125,000	,,	June 29	4	Edmonton } 4 p.c. Deb.	105—108	..	3 14 1
182,380	10	June 15	8	Tuscan, Ltd. . . .	9⅜—10¼	..	7 16 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
30,000	Stk.	Aug. 16	7¾	Wands- worth and Putney } A 5 p.c. . .	—	..	—
255,636	,,	,,	6¼	B 3½ p.c. . .	137—140	..	4 9 3
60,000	,,	,,	5 1/16	C 3½ p.c. . .	113—116	..	4 13 6
57,564	,,	June 29	3	3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord. .	104—106	..	4 14 4
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	122—125	..	4 0 0
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.	104—109	..	3 13 5

Prices marked * are "Ex. div."

REGULATIONS IN REGARD TO WATER SUPPLY.

The Work of the Joint Committee.

The Joint Committee on Water Regulations—which was formed some time ago, and which, as our readers are aware, comprises representatives of the majority of the chief water undertakings of the kingdom, the Royal Institute of British Architects, the British Association of Water-Works Engineers, and the Plumbers' Company—recently met at the Guildhall, London, to consider the report of the Sub-Committee appointed to deal with the codification of existing water regulations and the preparation of a draft code of model regulations, with schedules of details of fittings, materials, and workmanship, prepared by separate Sub-Committees, designed to secure uniform regulations and prevent the present avoidable waste of water. Dr. ROBERT CRAWFORD (Glasgow) presided over a good attendance. The Secretary to the Committee (Mr. W. R. E. Coles, the Clerk to the Plumbers' Company), and the Assistant-Secretary (Mr. Percy Griffith, M.Inst.C.E., F.G.S., the Secretary of the British Association of Water-Works Engineers), were present.

In their report, Sub-Committee A stated that the information that had been furnished from all sources for the use of the Joint Committee must be regarded as unique in its fulness and authoritative character. Much of it related to the varying rate of consumption of water in different towns, statements concerning waste (estimated at upwards of one-third of the whole supply), expenses incurred in the detection of waste, and reductions of waste due to the proper adoption of fittings and the efficient carrying out of plumbers' work. Reference was made to the want of uniformity in the prevailing practice of water undertakings, and it was stated that the regulations drawn up under the various enactments presented, when seen together, an almost endless variety and absence of plan. Further observation, however, showed that this appearance by no means implied want of plan or of purpose on the part of individual authorities. On the contrary, the very discordance of the regulations, even on elementary points, was seen to indicate in a very practical way the nature and extent of the difficulties with which the general body of authorities had to contend, and their common need for some extended powers to make bye-laws for defined purposes with corresponding regulations sufficiently specified, or alternatively for such amendment of the powers of the Local Government Board as would provide for the recognition of such common standards of practice as would represent an irreducible minimum of efficiency and convenience. The existing regulations, although varying so greatly, were substantially directed to common objects; and it was manifest that they should, so far as local conditions of supply and of use might allow, be standardized for common use.

At an early stage of their deliberations, Sub-Committee B found it desirable to obtain the views and assistance of manufacturers of water-fittings; and for this purpose a meeting of the manufacturers of the kingdom was called, at which general appreciation was expressed of the advantages of standardization from the manufacturers' point of view. The Sub-Committee were also impressed with the value of standardization, on account of the obvious convenience of uniformity to consumers. Attempts to standardize articles which had been under the consideration of the Engineering Standards Committee had been carefully avoided. In the case of pipes, tubes, and threads, the findings and reports of that Committee had been adopted *in extenso*.

The labours of Sub-Committee C were directed to the subject of workmanship. They considered on a reference from Sub-Committee A, the regulations of the various authorities relating to plumbers' work, with a view to the preparation of a scheme for securing their greater efficiency and uniformity. The result was that a scheme, designed first to give fuller effect to the object of the regulations in regard to the competency of plumbers employed to execute and inspect work, and, secondly, to render more effective the existing system of authorizing plumbers to do such work, was prepared; and, after being submitted to Sub-Committee A, its principal provisions were embodied in a schedule.

In the draft code prepared by Sub-Committee A, they sought, first, to codify the chief administrative provisions relating to the distribution of water for domestic and other purposes; secondly, to set up such standards of practice as represented, in the view of the several Sub-Committees, an irreducible minimum of efficiency—in other words, to establish a standard of practice below which no work should be permitted in the common interests of the water authorities and the public. The spirit of co-operation on the part of the several interests represented by the Joint Committee would, it might reasonably be anticipated, go far to facilitate the general administration of the Water Acts, and also to improve the somewhat strained relations which too frequently existed between water authorities and the public. A further important purpose served by the agreement arrived at by the several interests concerned was that it afforded a convenient basis upon which future legislation might be founded; and those smaller water authorities who suffered, in common with the larger ones, from the generally imperfect condition of the existing law, and were at a greater disadvantage in that they lacked the professional and administrative direction available to the larger authorities, might find their present difficulties greatly relieved by adopting the code.

The CHAIRMAN observed that the report submitted by Sub-Committee A was a very valuable and important one, marking, as it did, a considerable step forward towards the goal which they all desired to reach. It was rather an unusual thing for an outside body, such as the Plumbers' Company, to take upon itself to gather together all the various elements going to make up a complete whole in regard to the business of the distribution of water. At the first conference, the Company expressly stated that they were not desirous of undertaking a work which more properly belonged to others, but that, if there was a general wish for them to do it, they were willing to act. The Company were asked to undertake the work; and it was quite evident

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BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

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that they had been well supported by the water authorities, architects, manufacturers of water appliances, and all others concerned.

Alderman GAINSFORD (Sheffield), in moving the adoption of the report, said the Local Government Board's model set of regulations were antiquated, so that various local authorities and water companies were not able to look to them for guidance. Consequently, these authorities and companies were forced to draw up their own regulations, with the result that they took a certain form in one place and quite a different one in another. It was hoped that the Committee's draft code would be adopted by the Local Government Board, in which case they would have provided a model set of regulations suitable for present-day requirements. Of course, it would always be open to different authorities to make small modifications needed for local purposes.

Mr. SEARLES-WOOD (Royal Institute of British Architects) seconded the motion, and said that architects welcomed the opportunity of taking part in the framing of regulations more equitable to the consumer and more efficient from the point of view of the water authorities.

The report was adopted.

After a long discussion, a draft code of regulations to be observed by consumers, with schedules of technical details for the guidance of plumbers and others carrying out work, was approved; and it was resolved to submit it to the Local Government Board, with a request that they would consider it with a view to its general adoption. Committees were appointed for the further standardization of the fittings and materials used in the distribution of water, and for the publication of the reports and findings of the Committees of Finance and General Purposes.

Resolutions were also passed appointing a Standardization Committee, to deal with the further standardization of fittings and materials; and a General Purposes Committee, to consider measures for defraying the present and future expenditure of the Joint Committee, the publication of its reports and findings, and other matters.

WATER-MAINS UNDER HILSEA CREEK.

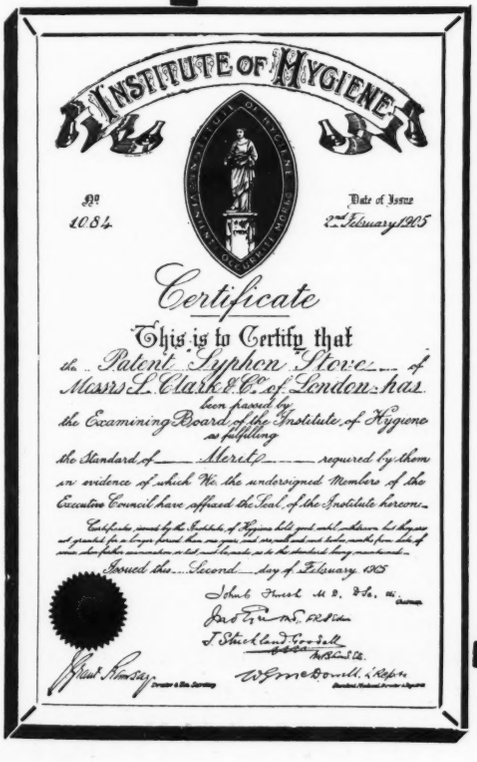
After two years of arduous and difficult work, the tunnelling of Hilsea Creek for carrying the mains of the Portsmouth Water Company has been completed by Messrs. Edmund Nuttall and Co., of Manchester. The task was undertaken mainly to supply a direct flow of water for the Admiralty to Portsmouth Dockyard; but the tunnel now contains no fewer than six mains—two of the 36-inch pipes being only for emergencies. They all rest on elm blocks, and can be readily got at either for repair or for cleansing. The shafts are each 15 ft. 8 in. in diameter, and are 66 feet in depth; while the tunnel itself has a diameter of 12 ft. 8 in. The mains are of the best steel, and are hand-riveted. The four others beside those mentioned are two 36 inches and two 20 inches in diameter. The two larger pipes are on either side of a platform, which extends from one end of the tunnel to the other; and the smaller pipes are under the platform. The mains have always, of course, been laid under the creek, which is a Government waterway on the Portsdown Hill side of the Hilsea Forts; but the tunnel is an entirely new arrangement, to construct which a 66-feet shaft for the great mains was carried down on the north side, from which for 600 feet it runs, below the creek to the great shaft on the south side. Clay and chalk constituted the principal excavations. The loam or surface ground was not more than 3 or 4 feet deep; and then came a bed of light clay about 16 feet in depth. After this all was chalk; and it is in this that the tunnel has been formed and laid. The Contractors' men have been constantly at work in day and night shifts; and at the inspection by the Directors of the Company last Thursday, the results of their labours were considered to be satisfactory in every particular. The tunnel is 30 feet below the bed of the creek.

NEW WATER SUPPLY FOR VIENNA.

Additional High-Level Works.

The "Engineering Supplement" of "The Times" recently contained an account, by Herr E. Probst, of the new water supply with which Vienna is to be provided. It appears that five years ago the municipal authorities decided to spend £4,166,000 for the provision of a second high-level supply, which, in honour of the Emperor's sixtieth birthday, was to be called the Emperor Francis Joseph Water Supply. The existing works have been unable to cope with the requirements of the increasing population, and the volume of water contained in the reservoirs has at times been so small that it has been necessary to issue public notices to avoid every possible source of waste. In order to put an end to this state of things, surveys were undertaken as far back as 1893 of all available sources of supply for a second water system, and, after prolonged investigation, it was decided that the abundant springs of the River Salza, on the borders of the Steiermark and Lower Austria, would, even in the severest winter, be capable of furnishing a minimum daily yield of more than 40 million gallons. As it was not possible to form accurate estimates of quantity for a portion of this area, owing to its large extent, it is hoped that the volume may even reach 44 million gallons per diem.

After a preliminary scheme had been completed, the foundation-stone of the new works was laid in 1900, and the municipal authorities of Vienna then undertook the detail surveys for their execution. The positions of the six springs which have been made use of range from 1968 feet to 2624 feet above sea level. The water is obtained by means of collecting-pipes, storage-galleries, chambers, or adits, in accordance with the site of the spring, and is brought from the various points to the main channel. The principal main has a total length of nearly 106½ miles, and the length of the collectors and branches at the


INSTITUTE OF HYGIENE

No. 1084

Date of Issue 2nd February 1905

Certificate

This is to Certify that the Patent Syphon Stove of Messrs S. Clark & Co. of London has been passed by the Examining Board of the Institute of Hygiene as fulfilling the Standard of Merit required by them in evidence of which We the undersigned Members of the Executive Council have affixed the Seal of the Institute hereon.

Certificate issued by the Institute of Hygiene 1st grade which allows the Stove to be granted for a longer period than one year and renewable and not liable to be withdrawn unless on the Stove ceasing to fulfil the standard being maintained.

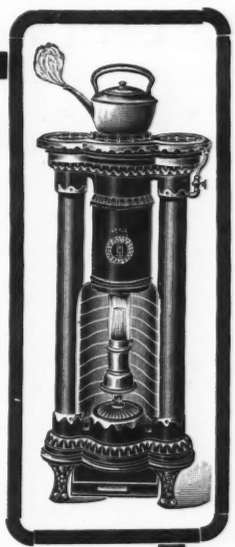
Issued this Second day of February 1905

John Hunt M.D. F.R.C.P. Chairman

Jas. Tyrrell M.D. F.R.C.P.

T. Shield Clouston M.D. F.R.C.P.

W. Macdonald Registrar



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gathering-ground is 13½ miles. The actual length of the main delivery is 113⅛ miles, and comprises 51½ miles of ordinary mains, 44 miles in tunnels, 16 syphons, consisting of double pipes each 43½ inches in diameter with a total length of about 12 miles, 43 aqueducts, and 53 bridges, besides other structural works of importance. The principal tunnel, passing through the Goestling Alps, has a length of 5872 yards; the longest syphon is 10,399 yards in length, and the shortest one is 90 yards long.

With reference to the gradients in various parts of the main, it may be stated that the gathering-ground for the most part is situated at a height of 2600 feet above sea level; while the level of the reservoirs into which the water is discharged at Mauer, near Vienna, is 1066 feet above the sea. The fall varies from 0·6 to 70 per 1000. The fall in the tunnel through the Goestling Alps was fixed, in order to reduce the length of tunnel to a minimum, at only 0·6 per 1000. The size of this tunnel is 6 ft. 6 in. in height by 6 ft. 3 in. in width, and, with the ordinary volume of water passing through it, the speed of flow would be close upon 3 feet per second. The rate of flow in the large syphons would be 4 feet per second.

The water supply procured by these means will be conveyed into a masonry chamber, situated at Mauer, which will serve to distribute it into the existing mains. Thence the main will pass into the present service reservoirs, and also into two new reservoirs which will shortly be constructed. These will be so placed as to be capable of supplying water to the higher parts of the city. Mains will also be laid to five small pumping-stations, which will lift the water required to serve the highest points in the city. Besides affording water for these purposes, a portion of the new supply will be diverted into the existing reservoirs to improve the service and to obviate the necessity of using two small pumping-stations and a water-tower now employed. All the available pressure at Mauer will not be required for these purposes; a second chamber will, therefore, be formed in the main at a suitable level.

When the main is not carried in cast-iron pipes, it will be built partly in masonry and partly in concrete, and will be oval in section. In many places the entire foundation and lower portion of the main will be formed in masonry, and only the arched top will be of concrete. In all parts it will be covered with earth to a depth of at least 40 inches. In some parts of the tunnelling a regular built-up conduit in stonework will be formed; whereas in others there will only be a lining of concrete. In all cases the bottom of the channel will be coated with concrete, to provide a smooth and level surface.

While the water is possessed naturally of qualities which specially adapt it for drinking purposes, in the course of its lengthy flow from the mountains it will become partly clarified, and will attain an equable temperature; thus placing Vienna in the front rank of large cities in respect to the excellence of its water supply.

The Directors of the Buenos Ayres (New) Gas Company, Limited, have declared an interim dividend at the rate of 6 per cent. per annum for the six months ended June 30.

THE POSITION OF THE ACETYLENE INDUSTRY.

Some interesting particulars as to the present position of the acetylene industry in the United Kingdom were given by Mr. Charles Bingham at the International Acetylene Congress held at Liége last July. The Acetylene Association have forwarded us a copy of his remarks, from which the following extracts have been taken.

It is to our regret that we have to say it; but the fact cannot be disguised that, in proportion to its population and the wealth of its inhabitants, acetylene lighting has made less progress in the United Kingdom of Great Britain and Ireland than in almost any other European country. The causes are not far to seek. In no country in the world, probably, are the other well-known illuminants—such as coal gas, electricity, and petroleum—so cheap and so easily procurable as in this country. Practically every village in Great Britain, even of 2000 to 3000 inhabitants, has its coal-gas installation; while many of the small towns have even both coal-gas and electric light stations. As regards the prices charged for coal gas, it may be mentioned here that a price of 5 c. to 6 c. per cubic metre is not uncommon. Petroleum, delivered at the consumer's door, has during the last five years varied in price from 4d. to 10d. per gallon (9 c. to 22 c. per litre). Electricity, generated in practically every case by steam, varies considerably in price, but can be obtained in most towns for about 4d. (42 c.) per kilowatt hour. Every facility is given by the corporations and companies supplying coal gas and electricity to enable a larger sale to be procured. Heating-stoves, cooking-stoves, and in some cases even lighting apparatus, are provided by the gas and electric light factories; a moderate rental being charged for the use of them. In many cases, coal-gas companies have even extended their supply-pipes some kilometres in order to prevent acetylene being adopted by an outlying village. Furthermore, a most astonishing number of castles, country houses, detached buildings, like fever hospitals, &c., have their own private installation for making coal gas or generating electricity. For country houses belonging to wealthy people who do not study the question of cost too narrowly, electricity is still preferred to acetylene in this country, though we are happy to be able to state that in many cases known to us it has been possible for energetic acetylene firms to induce the owners to replace electricity by our gas. It is, however, not to be wondered at that, in the face of such difficulties, the progress of acetylene in Great Britain has been comparatively slow—especially as, until the fall of the Willson carbide patents, calcium carbide was probably more expensive in this country than in any other European country. The fall of these patents has brought about a very considerable reduction in the price of the primary raw material; and it is satisfactory to be able to state that the industry, though increasing slowly, is undoubtedly in a more satisfactory condition than has ever been the case before. As in most other countries, the backbone of the industry has been the lighting of what we may perhaps call country houses of the second rank—namely, houses the owners of which hardly care to

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incur the considerable cost of an electric light installation, but, on the other hand, were tired of the imperfect light afforded by petroleum lamps. In this direction business is steadily growing; and it is found that if one house in a district be equipped with acetylene, it invariably leads to the example being followed by its neighbours. In village lighting satisfactory progress cannot be reported; the village and town installations which can really be called such only numbering about a dozen in the four united countries, England, Ireland, Scotland, and Wales. The prices charged average about 48s. per 1000 cubic feet (2 frs. 10 c. per cubic metre); but it is satisfactory to note that, since the reduction of the prices of carbide of calcium, the prices charged per cubic metre have also in many cases undergone reduction, and the consumption of acetylene has correspondingly increased.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The principal item of business at the meeting of the Edinburgh and Leith Gas Commissioners on Monday—the first they have held since July—was the fixing of the price of gas for the current year. This proceeded upon estimates of revenue and expenditure prepared by the Treasurer, Mr. John S. Gibb, and in the preparation of which, he explained, he had had the benefit of the aid and experience of the Chief Engineer, who had carefully formulated the items belonging specially to his own department—viz., expenditure for manufacture and distribution, and income from sale of gas and residual products. The probable income from the sale of gas (£255,024) was arrived at by the Engineer by taking the gas estimated to be sold to the ordinary consumers during the year at 2s. 9d. per 1000 cubic feet—the present figure—and the gas sold per prepayment meters, and for public lamps and stair lights, as well as for the supply of districts outside of Edinburgh and Leith, at the present rates. The Treasurer's estimates for the sinking funds proceeded on the basis of the minimum statutory allowances of 15s. and 20s. per cent. being set apart for the annuities sinking fund and the mortgage sinking fund respectively, and 5s. per cent. for the reserve fund, as prescribed by the Commissioners' Provisional Order. One penny per 1000 cubic feet on the year's estimated output of gas (1,853,876,600 cubic feet) represented £7724; and the estimated probable surplus on the year's working was £1230. The estimates provide for the same revenue from gas as was earned last year; for £20,171 from coke, as compared with an actual receipt last year of £19,504; of £12,833 from tar, as compared with £13,614; and of £20,461 from sulphate of ammonia (less working expenses), as compared with £20,985. The total estimated revenue is £309,085, as compared with an actual revenue of £309,723. On the expenditure side, coal is estimated to cost £102,464, as compared with £108,152; gas oil, £5659, as compared with £4524; and the other items for manufacture of gas at practically the same sums as were earned last year, bringing the total amount up to £155,117, as compared with £159,671. The cost of distributing gas is estimated at £29,628, as compared with £25,824; the increase being due to the cost of repairing and fitting up stoves having been raised from £30 to £3835. The sinking and reserve funds are all slightly increased, and there is a new item of £1000 in a suspense account for Granton properties. The total expenditure is estimated at £307,855; leaving the estimated surplus of £1230. The estimates were approved, and the price of gas fixed as recommended. Authority was given to the Treasurer to borrow for three or five years, at 3¼ per cent., £61,910 to provide for a payment of £8750 to the Corporation of Edinburgh, being a third instalment of a loan of £350,000, and to replace £53,164 of mortgages falling due. It was reported that the valuation of the undertaking of the Commissioners for the current year had been fixed at £95,080; being £90,457 within the city of Edinburgh, £2724 within the town of Leith, and £1919 within the county of Midlothian. The total valuation is increased by £12,372.

The Corporation electric lighting in Stirling broke down on Monday night, about half-past seven o'clock. Nearly all the arc lamps in the town went out; and domestic and shop lighting were seriously affected. It was not till Thursday that it was discovered that one of the armoured cables had been damaged, presumably by a blow from a pick, at a distance of about two miles from the centre of the town.

The Kilwinning Gas Company in the past half year earned a profit of £323, out of which a dividend at the rate of 12s. per share has been paid, absorbing £300; and the balance of £23 has been carried to reserve, to provide for depreciation of plant, &c.

The chimney at the old gas-works in North Berwick, which was a considerable disfigurement to the town, was demolished on Monday last. The method followed was that of excavating a portion of the side of the chimney and shoring up with wood, which was then set fire to. The chimney fell in one piece on the lawn. It was 90 feet in height.

On Thursday, a company of gentlemen connected with manufactures in the North of Scotland met at the granite works belonging to Mr. N. Reilly, in Great Northern Road, Aberdeen, to witness the working of a suction gas plant, erected there by the National Gas-Engine Company, Limited, of Ashton-under-Lyne. The gas, it was stated, is manufactured at the cost of 6d. per 1000 cubic feet. It is employed to drive two engines; and Mr. Reilly explained that whereas formerly he paid £3 a week to the Corporation of Aberdeen for gas to drive his plant, he can now do the work for 9s. 10d. per week.

The members of the Aberdeen Gas and Electric Workmen's Friendly Society held their annual social meeting in the Trades Hall of that city on the evening of Friday last. Mr. Kemp, the Convener of the Gas and Electric Lighting Committee of the Town Council, presided, and said that the membership of the Society now numbered 295—an increase of five during the year. Their income was £105, and their expenditure £72, leaving a balance of £33. Their benevolent fund now amounted to £93. He considered that those figures were highly satisfactory. He complimented the gas workers upon the splendid work they were now doing. By their exertions the Council had been able to reduce the price of gas, and they were thereby e abling the

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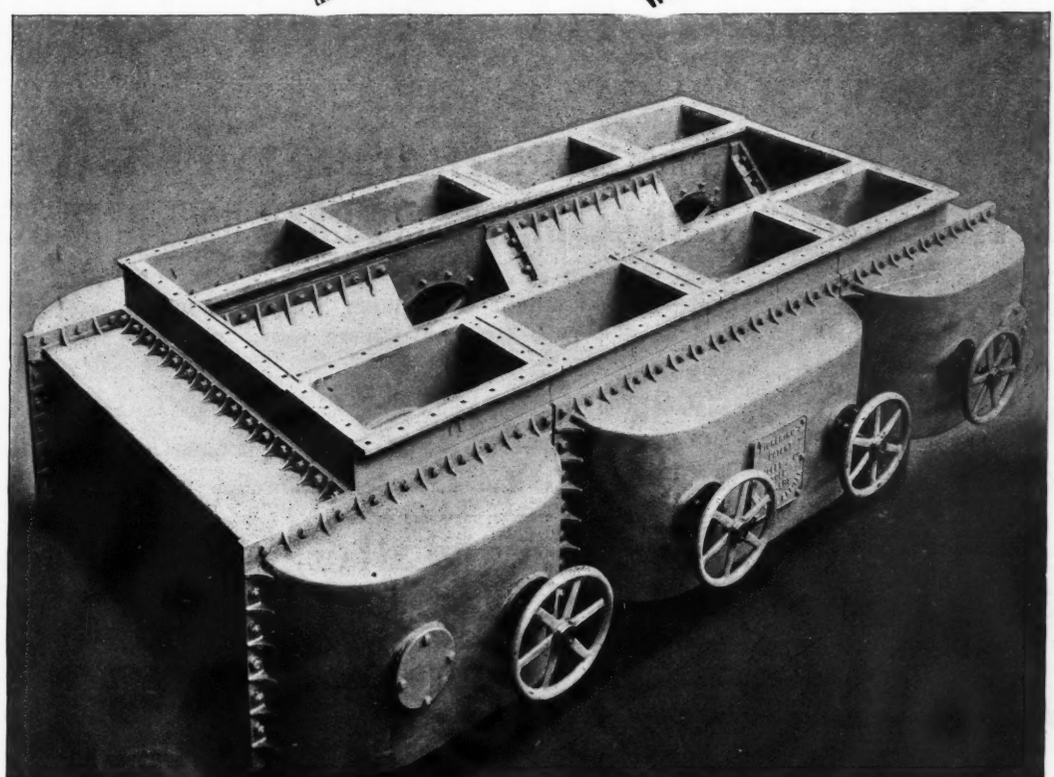

VIEW OF CENTRE-VALVE TO WORK 4 LARGE PURIFIERS, 24-INCH CONNECTIONS. N.B.—THIS IS NOT THE LARGEST WE MAKE, BUT LARGE ENOUGH TO BE INTERESTING.

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community to meet the increased assessments which the Town Council had imposed. A concert and dance followed.

The turning on of the waters of the Talla for the supply of Edinburgh and Leith was successfully accomplished on Thursday. The inconveniences attendant upon a diminished supply of water are thus removed; and, barring accidents, it is scarcely conceivable how such a state of matters as has been threatened this year can occur again. The supply is so ample that it will serve the district, assuming the accustomed increase of population, for many years without augmentation; and when augmentation becomes necessary, all that will require to be done will be to make a new reservoir, construct a short tunnel, and lay about fourteen miles of piping. The Talla scheme has been an expensive one; but there is reason to believe that the works in connection with it have been carefully executed, and certainly their inception and design have been such as to meet with the commendation of the most exacting. The water itself is of quite as good quality as the previous supplies—in fact, no change in taste or appearance is observable. Though the water is being supplied, it may be stated that the Talla reservoir is not yet full. The water will require to rise a further eight or nine feet before it overflows the embankment.

The town of St. Andrews is suffering from a water famine. The probability that it would be so by this time was foreseen in the early part of the summer; but the Magistrates, for fear that they would frighten visitors away, continued to give a full supply until the reservoirs were exhausted. This took place on Sept. 7. Since then the practice has been to shut off the supply daily when it fails—usually about three o'clock in the afternoon—to collect as much water as possible, and to turn it on at six in the morning. The attention of the Local Government Board having been called to the situation, they sent their Medical Inspector—Dr. Dittmar—to the town on Sept. 21, to investigate the arrangements for the water supply. This gentleman has reported at great length. He considers part of the supply as contaminated to an extent that can only be called disgusting. About 400,000 gallons are required daily; and at the date of the Inspector's visit the flow was only equal to 178,000 gallons. The Inspector, in strong language, refers to the payment of a fee of thirty guineas to a water diviner, and to the expenditure of several hundreds of pounds in making bores at the places indicated by him, with results which hitherto have not been encouraging. On receipt of this report, the Local Government Board have written to the Town Council, calling upon them, in view of the serious state of matters disclosed, to take immediate steps to prevent further pollution of present sources, and to provide an additional supply, as the existing one appears to be quite inadequate. The Board further require to be furnished with a copy of the report by the diviner, and particulars of any works carried out on his suggestion, with the expense incurred in connection therewith; and they wish to be informed to what extent the water supply has been increased by acting on the suggestions of the diviner. This communication was received on Wednesday. It has caused a good deal of consternation; but as yet there has not been time for the Town Council to do anything in compliance with it.

CURRENT SALES OF GAS PRODUCTS.

Week ending Sept. 30.

The London market for tar products has shown increased life and activity during this week. Pitch is in good demand for delivery during any part of the season, at improving prices; the highest sale reported being at 29s. 6d. net f.o.b. makers' works. Benzol, 90 per cent., continues firm at 10d. net; while 60's crude carbolic acid is also much inquired for at 1s. 8d. net, which figure is not acceptable to makers. There are buyers of solvent naphtha and toluol for forward delivery—prompt lots having been absorbed; but as the outlook is good, makers prefer to wait. Sulphate of ammonia maintains its strong position; the quotation for October being £12 15s. on Beckton terms.

Sulphate of Ammonia. LIVERPOOL, *Sept.* 30.

The market has continued firm during the week; and if the volume of business has not been large, this has been due to the fact that the production has not shown much expansion so far. Consequently the parcels offering have not been numerous; and as they were well competed for, a further improvement in values is noticeable at the close. Quotations to-day are £12 10s. per ton f.o.b. Hull, and £12 15s. per ton f.o.b. Liverpool and Leith; and in London £12 15s. per ton, Beckton terms, has been paid. In forward delivery, some business is reported in Scotland at £12 17s. 6d. per ton for shipment during the early months of next year.

Nitrate of Soda.

This article is firm; and prices have been advanced to 10s. 6d. per cwt. for ordinary and 11s. for refined quality, on spot, and for spring delivery.

Tar Products. LONDON, *Sept.* 30.

Business has been rather brisk during the past week, and there appears to be more doing all round. Benzol is very firm. Ninety per cent. is reported to have been sold at 10d. f.o.b. London in more than one instance for October-December delivery; while 50-90 per cent. has been placed at prices varying from 9d. to 9½d., according to situation. Toluol is very scarce indeed, and there is really nothing offering for prompt delivery, for which there are buyers of small quantities at 10⅛d. As regards forward business, however, makers will not offer, believing in higher prices later on, as there seems likely to be a scarcity of this article. Creosote continues in very strong demand both in London and the Provinces. Manufacturers here appear to be almost entirely out of stock for prompt delivery; while for forward 1⅜d. may be taken as the market price for ordinary oil of good merchantable quality. In Yorkshire, business is reported at 1 5/16d. and 1⅜d. for October delivery; but the best makers ask 1 7/16d. to 1½d. for October-December. Solvent naphtha continues

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in very strong demand, especially in London, where makers appear to be fully sold. Further business is reported at 9⅛d. for October delivery, and there is really only a little offering even at this price; while for prompt it is very difficult indeed to obtain delivery. The heavy qualities are also selling very freely; and contracts are reported to have been made at good prices for delivery all over next year. Carbolic acid remains stationary. There is a fair business doing at 1s. 8d. to 1s. 8¼d. for October-December delivery. Foreign consumers, however, do not care to purchase farther forward just at present; while makers ask 1s. 9d. for January-June. In crystals, there is very little offering. So far as the English makers are concerned, the nominal price may be taken as 6⅝d. for 39 40 per cent.; but the German manufacturers have evidently accepted under this price in more than one instance. The market for pitch is better, and there has been a slight recovery from the depression of last week. London producers report having done business at 28s. 6d. for January-June, and have refused this price for further quantities; while Yorkshire makers decline to offer just at present for forward delivery—doubtless owing to the uncertainty which prevails as regards some of the large tar contracts. In South Wales, consumers are still open to purchase for January-June; and it is reported that a large business has been arranged for October-April during the past week with consumers both in Cardiff and Swansea. There is really nothing fresh to advise in anthracene, and neither consumers nor distillers appear to take any interest in this article.

The average values during the week were: Tar, 16s. 6d. to 21s. Pitch, London, 28s. 6d. to 28s. 9d.; east coast, 28s. to 28s. 3d.; west coast, 26s. to 26s. 6d. Benzol, 90 per cent., 10d.; 50-90 per cent., 9⅛d. to 9⅛d. Toluol, 10d. to 10⅛d. Crude naphtha, 3⅛d.; solvent naphtha, 9⅛d. to 9⅛d.; heavy naphtha, 10⅛d. to 11d. Creosote, London, 1⅜d.; North, 1⅛d. to 1⅜d. Heavy oils, 2⅛d. to 2 5/16d. Carbolic acid, 60 per cent., 1s. 8d. to 1s. 8¼d. Refined naphthalene, £4 to £8 10s.; salts, 14s. to 16s. Anthracene, "A" quality, 1⅛d. to 1⅜d.; "B" quality, unsaleable.

Sulphate of Ammonia.

There has been a very strong demand during the past week, and the market closes with a very firm tone. London manufacturers are really not offering for prompt delivery; but the nominal price may be taken as about £12 15s. In Leith, sales are reported at £12 15s. for October shipment; while for 1906 still higher prices are reported to have been paid. One or two small sales have been made in Hull, at prices varying from £12 11s. 3d. to £12 12s. 6d. for October-December shipment; but there is really very little offering. The demand in Liverpool is very good, and there appears to have been a fairly good business doing at slightly over the prices mentioned last week.

Sale of Shares.—Last Friday, Mr. R. K. Jenkins sold by auction 250 fully-paid £10 shares in the Aberystwyth Gas Company. The average price realized was slightly over £11 5s. per share.

COAL TRADE REPORTS.

Lancashire Coal Trade.

During the week a considerable improvement has been manifested in the Lancashire coal trade. Many orders have been received for house coal, both from merchants and private householders; and the general outlook in this department is favourable. In consequence of this increased activity in domestic requirements, more slack has been made at the pits. This commodity has been difficult to obtain for some months past owing to the strong demand for engine fuel, which is likely to increase rather than diminish. However much is made is at once taken away. Prices for engine fuel are very firm, and may be said to be hardening. There is also more demand for gas coal and cannel on existing contracts, as a result of the shortening days. Notwithstanding that the price of coal in London has increased 1s. per ton, and the West Yorkshire coalowners put up the price of house coal and nuts 1s. per ton yesterday (Monday), the prices on the Manchester Exchange remain unaltered. On Wednesday, the Coal Conciliation Board for the English Federated Mining Districts met at the Queen's Hotel, Manchester, to consider the application of the masters for a reduction of 5 per cent. in wages, which would bring them down to the minimum under the joint agreement. No resolution, however, was arrived at, and the meeting adjourned. The question is to be referred to Lord James of Hereford, who arbitrated on the subject some months ago.

Northern Coal Trade.

There has been a keener demand for coal; continued orders having been received from Russia, which are giving general activity to the collieries, as much of the coal is for early shipment. In the steam coal trade, there is a good inquiry; and prices of best Northumbrian steams are about 9s. 6d. per ton f.o.b., second-class steams are steady at 8s. 6d. to 8s. 9d. per ton, and steam smalls are less scarce at from 4s. 9d. to 5s. 6d. Naturally, the gas coal trade is influenced by the activity in the market more than by any large additional orders. The deliveries on the long contracts are now increased, and take up a larger part of the production, so that the very best classes are now relatively scarce. Quotations for Durham gas coals are stiffer, at from about 8s. to 8s. 9d. per ton f.o.b., according to quality. For contracts, the price is firmer; and with long-forward delivery, a slightly-higher quotation is being made. No very heavy contracts for gas coals are reported this week; but some for export to the south of Europe are negotiating. Gas coke is irregular. Where exports are made, there is a better inquiry, and prices are steady; but the inland companies find prices dull. From 10s. 6d. to 11s. 6d. has been tentatively quoted on the Newcastle Exchange.

Scotch Coal Trade.

While it cannot be said that there is any perceptible improvement in trade, there is an expectation of better things soon. This is apparent from the fact that coalowners are indisposed to sell forward

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except at enhanced prices. For spot sales, there is, as yet, no advance in prices, which are quoted at: Main 7s. 3d. to 7s. 9d. per ton f.o.b. Glasgow, ell 8s. to 9s., and splint 8s. 6d. to 9s. In volume, shipping shows an improvement. The shipments for the week amounted to 276,896 tons—an increase of 13,788 tons upon the week, and of 30,668 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 8,888,445 tons—an increase of 464,467 tons upon the same period of 1904.

Coventry and the Bedworth Gas Supply.—The Bedworth Parish Council have been devoting a considerable amount of attention to the question of the gas supply; and at the last meeting one of the members said it would be a blessing to the town if they could get gas at a cheaper rate than was charged by the local Company. Perhaps if the Council approached the Coventry Corporation, Bedworth could obtain gas cheaper without any injustice to anyone. Another member remarked that he had mentioned the matter to several members of the Coventry Gas Committee, who held the opinion that they were not empowered to supply gas in the parish of Bedworth. A resolution was passed that the Coventry Corporation be approached with the object of getting a cheaper supply of gas if they are able to furnish it.

Gas versus Electricity at Ingleton.—Some few years ago, an Electric Lighting Company was formed at Ingleton; and thereupon the lighting of the streets was handed to them, and the gas-lamps were removed. During the intervening period, some friction has arisen between the Gas and Electric Companies; and litigation is pending at the present time. The Electric Light Company, having secured their powers from the Board of Trade, are seeking an injunction to restrain the Gas Company from breaking up the streets. This is not all, however, for the price of gas having been reduced, along with an improvement in the quality, a meeting has been held at which it has been decided, by a small majority, to light the streets by gas for the next twelve months, at a cost of £20 less than the figure quoted by the Electric Light Company.

Conditions of an Acetylene Loan.—The Local Government Board have recently sanctioned a loan for the purpose of lighting a hospital by acetylene, under the following conditions: (1) That ventilating openings to the carbide store near the ground level would be provided. (2) That no naked lights would be allowed in any part of the gas-house; artificial lighting being effected by providing an outside light shining through glass into the interior. (3) That hot-water pipes, heated by a small outside stove, provided in a separate building, would be placed in the generator-house. The Board also stated that they assumed the authority concerned would obtain satisfactory guarantees or otherwise take steps to ensure that the carbide to be used in the apparatus would be uniformly of the best quality that could be purchased. Of course, these conditions refer only to the particular case that was then under consideration.

Electricity or Gas-Works Purchase at Bourne.—The Bourne Urban District Council have held a special meeting for the purpose of considering an electric lighting scheme which has been laid before them by the local Tradesmen's Association. Among the advantages claimed for the proposal by the Association was the cheaper and more efficient lighting of the streets; it being stated that the amount at present paid to the Gas Company was sufficient to repay the interest and principal on the loan that would be required for electricity. The Council ultimately passed a resolution to the effect that before any further steps were taken with a scheme for installing the electric light in the town, a deputation should be appointed from the Council to confer with the Gas Company and ask for an immediate reduction in the price of gas to ordinary consumers, and also at what price the Company would be prepared to sell their undertaking to the Council.

Ipplepen Water Supply.—An inquiry was held at Ipplepen, Devonshire, last Thursday respecting an application which had been made to the Local Government Board for sanction to borrow £2300 for purposes of water supply. It was explained that the village was at present supplied by wells, some of which are liable to pollution. The new supply will be furnished by the Paignton Urban District Council when their new works are completed, and the price charged will be 8d. per 1000 gallons. Colonel A. J. Hopper, who conducted the inquiry, put some questions as to a clause in the agreement under which Paignton may terminate it on three years' notice, and said that if the loan were granted for 30 years, Ipplepen might have to go on paying for 20 years for something which they did not possess. Mr. F. Horner, the Clerk to the Newton Abbot Rural District Council, said that by another proviso Paignton was only to give such notice in the event of it being unable to supply itself with water for domestic purposes. Mr. Vanstone, the Engineer, explained that the proposed works would be available for water from another source if it was high enough, and therefore would not be useless in case the Paignton supply ceased.

Hanley Water Supply.—It was stated at the last meeting of the Hanley Town Council, with regard to a recent deficiency in the water supply, that a letter had been received from the Staffordshire Potteries Water-Works Company explaining that two of the three engines at the Hatton pumping-station, which was the principal source of supply to the Potteries district, had to be laid off, owing to defects. The third engine, however, was kept fully at work, and also the Company's other pumping-stations; the result being that the aggregate supply fell not far short of the normal. No one felt more acutely than the Company the annoyance of any disturbance of the supply; but he pointed out that the effect would not be felt so much if at least the larger houses and business premises—and, of course, all manufactories—had more reasonable storage. The Sanitary Committee recommended that the Council should respectfully suggest to the Company that it would appear advisable that the Company should provide sufficient storage accommodation to avoid inconvenience to consumers in the event of any breakdown. It was stated during the discussion that the shortage of water in Hanley was frequent, inconvenient, and costly; and that on the occasion of a fire there had invariably been an inadequate supply for a long time past. The recommendation of the Committee was confirmed

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Sulphur in the Tottenham Company's Gas.—The Tottenham Urban District Council had this subject, which was referred to in the "JOURNAL" last week (p. 836), again under consideration at their meeting on Tuesday, with the result that they resolved to take proceedings against the Gas Company for permitting excess of sulphur in their gas.

New Water Supply for Middlewich.—The inhabitants of Middlewich have received with great satisfaction the news that the Urban District Council's boring operations at Delamere have been successful. A supply equal to 456,000 gallons per twenty-four hours has been found at a depth of 300 feet. During the past five years, numerous schemes for augmenting the water supply have been tried without success; and great inconvenience has been experienced through the scarcity of this necessary of life. So meagre is the supply at present that the water is only turned on an hour each day, and is conveyed to the higher parts of the district in tanks.

The Proposed Lighting of Scalby.—For a second time the Scalby Urban District Council have discussed the question of the lighting of the village. It was stated that an offer had been received from the Scarborough Gas Company to erect twelve standards, at a charge, including lighting and maintenance, of under £3 per lamp per annum. A resolution that this offer should be accepted was lost by one vote. That the councillors hold widely divergent views on the subject is manifest by the remark of one that it was ridiculous to say people could not find their way about, and of another that he marvelled how anyone in this age could oppose such a scheme.

The German Incandescent Gaslight (Welsbach) Company.—The accounts of the German Incandescent Gaslight (Welsbach) Company for 1904-5 show gross profits amounting to £43,755, as compared with £20,454 in the previous year; and after writing off £7076 for depreciation, as contrasted with £3485 in the preceding twelve months, there remains a net profit of £36,679, as against £16,969. It is proposed to pay a dividend at the rate of 20 per cent., as compared with 12 per cent. last year, to transfer £1250 to the official and workmen's funds, and to carry forward £1294, as against £1181 a year ago. The development of business so far during the current year is stated to have been satisfactory.

A Reduced Profit at Dorking.—The report which was adopted at the half-yearly meeting of the Dorking Gas Company last Tuesday stated that the operations of the six months to June 30 showed a reduction in the profit on the revenue account compared with the corresponding period of last year, due to a decrease in the sale of gas, and the great depreciation in the value of coke and tar. The almost continuous progress which the Company had made in the past, had naturally received a check by reason of the introduction of electricity into Dorking; but the actual decrease in the quantity of gas sold might be accounted for by an unusual number of unoccupied houses in the Company's district, and by the general adoption of more economical methods in the consumption of gas. The Directors, however, were able to report a fair increase in the sale of gas during the June quarter, which, with the continuation of the present satisfactory addition of new consumers, they had reason to believe would be maintained. There was a balance of £1274 available for distribution; and out of this the Board recommended the declaration of dividends at the rate of 6 per cent. on the "A," "B," and "C" shares, and 5 per cent. on the "D" shares. This would leave a balance of £20 to carry forward.

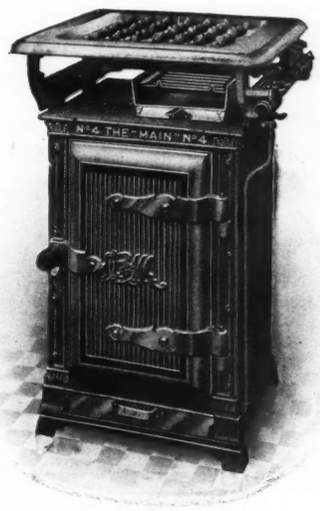
Municipal Ownership in Chicago.—"Progressive Age" states that municipal ownership in Chicago recently "staggered a bit," for its advocates were dazed by a decision given at Indianapolis by Judge Francis E. Baker, of the United States Circuit Court, holding that cities have no power to take over the property of public utility corporations, even when the right is stipulated in the franchise. The city officials were bewildered; but the Mayor announced that the finding had no bearing on the municipal ownership situation in Chicago. The question was one of such grave doubt that he "dodged" the possibility of future trouble by conceiving the idea of starting a new and independent trolley system to compete with the present lines. The more officialdom analyzes the decision and the bearing it may have on municipal ownership in Chicago, the more tangled its conclusions become. When the Consumers' Gas Trust Company was organized in Indianapolis, in 1887, the Charter contained a clause to the effect that at any time after ten years the city might appoint appraisers and take over the property at the declared value. Some weeks ago the city authorities gave notice that they would exercise this right; and a stockholder in the Company filed a bill in the United States Court, denying that the Company could legally have made any such compact. This was in the face of a formal acceptance of the provision by the Company. Judge Baker sustained the stockholder's contention.

Aldershot Gas and Water Company.—At the last meeting of the Aldershot Gas and Water Company, Mr. A. F. Wilson (who has been Chairman for the past 24 years) was able to refer to a very satisfactory condition of affairs. There was an increase in the gas consumption for the six months to June 30 of 5¼ per cent., compared with the corresponding period of 1904. The income from the sale of gas was £14,632, from residuals £5654, and from water £4621. Other receipts brought the total income up to £25,636; and after deducting from this the expenditure, there was a balance to carry to profit and loss account of £6814. Out of this, dividends were declared at the rates of £11 16s., £8 16s., and £7 per cent. per annum on the various classes of shares. Allusion was made by the Chairman to the fact that for some time past they had been occupie d industriously on the reconstruction of old works, and the construction of new ones. Now, he said, they were the owners of gas-works which were quite as presentable and efficient as were required, and which invited favourable comparison with any similar works in the country. This enlargement must undoubtedly be a source of considerable satisfaction to them all, because in past years, owing to the rapid increase in their business, it had been undoubtedly difficult to keep pace with the demands made upon them. A vote of thanks was passed to the Chairman, Directors, and staff; some highly complimentary remarks being made with regard to the work of the Secretary and General Manager (Mr. R. W. Edwards).

The "MAIN"

Gas

Cooker



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R. & A. MAIN, LIMITED,

LONDON, GLASGOW, FALKIRK, BRISTOL, MANCHESTER,

BIRMINGHAM, AND BELFAST.

St. Helens Corporation Accounts.—The accounts of the Borough Treasurer of St. Helens (Mr. J. Brown) for the year ended March 31, show that on the gas-works the net excess of assets is £93,838, or a decrease on the year of £10,529; but it is explained that this decrease is attributable to £20,000 from the reserve fund having been applied to reduce the amount of capital expenditure. The net profit for the twelve months was £11,200, of which £5000 was appropriated to the borough fund, £5000 was carried to the reserve fund, £1658 was applied to meet expenditure on mains, and the balance of £159 was added to the suspense account. This appropriation brought the total carried to the borough fund to £61,030, and the total of revenue applied to meet gas-works capital expenditure to £35,501, in addition to £22,476 so applied from the reserve fund. The net excess of assets on the electricity works is £25,209, or an increase of £5940. The profit on this undertaking was £1403. On the water-works account, the balance of assets is £113,051, or an increase of £3052.

Messrs. Joseph Taylor and Co. have received repeat orders for their latest make of solid-plate lead saturators from the Carlton Iron Company, Limited, the South Shields Gas Company (for their Jarrow Works), and the Douglas (Isle of Man) Gas Company; also for their best make of saturator for the Carlisle Corporation Gas Department and the Weston-super-Mare Gas Company. The firm have likewise in hand a large saturator, for either fishing or steam-discharging, weighing about 12 tons, to the order of a well-known gas-plant firm.

We have received the public lighting catalogue of the Welsbach Incandescent Gas-Light Company, Limited, for 1905-6, which contains numerous new patterns of self-intensifying lamps for exterior and interior lighting. Attention may be directed to the seven lamps shown on pp. 32-8, two of which, specially designed for interior decorative lighting, are of artistic patterns. Two others are storm-proof lamps. The Company's shadowless lantern, with self-intensifying burner, of which a large number are in use in Newcastle-upon-Tyne and the district, is shown on p. 23; and following it is the improved model of their self-intensifying square street lantern. The rest of the catalogue consists of other samples of lanterns, lamp-columns, burners, mantles, fittings, &c., all of which are effectively printed.

The Richmond Gas Stove and Meter Company, Limited, held last Friday the half-yearly conference of their representatives at their London offices and show-rooms. Mr. H. M. Thornton presided. During the afternoon the representatives visited the Company's meter-works at Chelsea, and were afterwards entertained at dinner at the Trocadero.

The Hasland Coking Company, Limited, has been registered with a capital of £12,000, in £1 shares, to carry on the business of coke manufacturers and merchants, manufacturers, producers, and buyers of, and dealers in, coke, gas, tar, ammonia, and other residual products resulting from the manufacture of coke, &c. There will be no initial public issue.

The Nelson Patent Lighting Company, Limited, has been registered with a capital of £2000, in £1 shares, to adopt an agreement with Messrs. J. Blakey, J. Carter, and T. Rycroft, and to carry on the business of gas-fitters, electricians, engineers, producers of, and dealers in, electricity for motive power and light, &c. There will be no initial public issue.

The Corporation of Glasgow have let contracts for the supply of 1230 tons of cast-iron pipes required for portions of the new main to be laid from the Gorbals Water-Works to the city, and of 936 tons of 18 to 36-inch cast-iron pipes for the extension of the West Craigmaddie main, to Messrs Macfarlane, Strong, and Co., Limited, of Glasgow. The amount of the two contracts is £10,133.

The New Conveyor Company, Limited, who supplied the first coal-conveyor for conveying coal to gas-producers about twelve years ago to Messrs. Storey Bros. and Co., of Lancaster, have received a repeat order from Messrs. Beardmore and Co., and are putting in very complete plants to feed gas-producers at the works of Messrs. Cammell, Laird, and Co. and Messrs. Vickers, Sons, and Maxim.

The Tottenham and Edmonton Gas Company some time ago fixed automatic lighting and extinguishing appliances to a large number of the public lamps, without having obtained the consent of the Urban District Council. At last Tuesday's meeting, the matter was reported upon by the General Purposes Committee, who recommended that the Company be requested to move all these fittings; and the recommendation was agreed to.

WANTED, FOR SALE, CONTRACT, &c. ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SECRETARY AND MANAGER OF WATER-WORKS. Herts and Essex Water Company, Victoria Street, S.W.
REPRESENTATIVE FOR INCANDESCENTS. No. 4474.
FOREMAN STOKER. Neath Gas-Works.

Situations Wanted.

GAS-WORKS PLANT SUPERVISOR. No. 4472.
WORKS OR GENERAL MANAGER. Snapper, 28, Victoria Street, S.W.

Plant (Second Hand) for Sale.

GAS PLANT, HOLDER, &c. Glover, J. T., Tamworth.
HYDRAULIC MAIN, STAND, BRIDGE, AND DIP PIPES, MOUTHPIECES, CONDENSER, WASHER, PURIFIERS, STATION METER, AND GOVERNOR. Peebles Gas-Works.
LAMPS, COLUMNS, &c. Malton Gas Company.
PURIFIERS. Sheldon, Wells.
SCRUBBER, VALVES, &c. Formby Gas-Works.

Plant Wanted.

BOILER. No. 4473.

Stocks and Shares.

BRIGHTON AND HOVE GAS COMPANY. Oct. 17.
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. Oct. 17.
CRAYS GAS COMPANY. Oct. 17.
HORLEY GAS COMPANY. Oct. 17.
LEA BRIDGE GAS COMPANY. Oct. 7.
UXBRIDGE AND HILLINGDON GAS COMPANY. Oct. 17.

TENDERS FOR

Coke.

SHEFFY GAS COMPANY. Tenders by Oct. 12.
WEST OF ENGLAND CHINA, STONE, AND CLAY COMPANY. Tenders by Oct. 18.

Fire-Clay Goods.

NELSON GAS DEPARTMENT. Tenders by Oct. 12.

Incandescent Mantles.

MIDDLETON GAS DEPARTMENT. Tenders by Oct. 14.

Light Oil.

BRIDGWATER COLLIERIES. Tenders by Oct. 23.

Pipes.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by Oct. 12.

Tar and Liquor.

BLACKPOOL GAS DEPARTMENT. Tenders by Oct. 11.
KNUTSFORD LIGHT AND WATER COMPANY. Tenders by Oct. 9.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOgovernors.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
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DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd., HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

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(NATURAL.)

BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.)
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
Brotherton and Co, Ltd., Chemical Manufacturers. Works: Birmingham, Leeds, and Wakefield.

"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
Telegrams: "Enamel." National Telephone 1759.

SPENT OXIDE.
THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "Metrogas, London."

JOHN RILEY & SONS, Chemical Manu-facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

AMMONIACAL Liquor wanted.
Brotherton and Co., Ltd., Ammonia Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, and Wakefield.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
Read Holliday and Sons, Ltd., Huddersfield.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, Leeds. Correspondence invited.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: Saturators, Bolton. Telephone 0848.

GAS TAR wanted.
Brotherton and Co., Ltd., Tar Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, and Wakefield.

TAR AND LIQUOR WANTED.
Best Prices paid.
Dent and Co.,
Ouse Chemical Works, Selby.

BIGGS, WALL, & CO., 13, Cross Street,
Finsbury, E.C. *Telegrams:* "Ragout," London. *Telephone:* 273 Central.
Exhausting Plant—See Advt. in last week's issue.
Sulphate Plant—See Advt. in this week's issue.
Charging Machinery—See Advt. in next week's issue.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.** Illustrated sheets on application.
JOHN WALSH WALSH,
Soho and Vesta Glass Works, BIRMINGHAM.
Telegrams: "Vesta, Birmingham."
National Telephone: No. 63.
London Show-Room: 4, Holborn Circus, E.C.

GAZINE—A radical Solvent and Pre-ventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. Bourne, 120, Manor House Road, Newcastle-on-Tyne.

GAS-WORKS PLANT. CARBONIZING PLANT.
ADVERTISER, having splendid Com-mercial and Technical Experience in the Organizing and Execution of Large Gas-Works Plant at Home and Abroad, is open to negotiate with a Company desirous of securing his services. Inclined Retort Installations on the most modern and up-to-date principles a speciality.
Address No. 4472, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WORKS OR GENERAL MANAGER.
QUALIFIED Civil and Mechanical En-gineer requires Engagement in General Engineering Works. Thoroughly sound and practical man in every particular, with excellent Commercial Experience. Very energetic. Good Organizer and strict Disciplinarian. Lighting, Heating, Ventilation, &c., a speciality. First-Class Connection in London and Country. Owner of valuable Patents that require working. Sound Agency would be entertained. Highest possible References and Testimonials.
Address "Snapper," 28, Victoria Street, Westminster, S.W.

REPRESENTATIVE wanted for Incan-descents, holding another Commission and calling on Gas Companies.
Apply, by letter, to No. 4474, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

NEATH CORPORATION GAS-WORKS.
FOREMAN of Stokers wanted. Must understand Regenerative Furnaces, Engine and Exhauster, and the Working of Pressure, &c. Wages 5s. 6d. per day of Twelve Hours; time-and-a-half for Sundays. No one need apply without they are thoroughly steady and reliable.
Apply to the Engineer and Manager, Robt. Alex. Browning.

WANTED, by the Herts and Essex Water-Works Company, Limited, a SECRETARY and Local MANAGER, to undertake all the duties of the Company and to be thoroughly capable of undertaking the local Management of the Pumping Station and Distribution of Water. Salary, £150 per annum, and House.
Applications are to be accompanied by two *copies* of Testimonials and full statement of past Experience, and are to be delivered on or before the 21st of October, 1905.
F. H. Anson,
Managing-Director.
Herts and Essex Water-Works Company, Limited, 28, Victoria Street. S.W.

SMALL Cornish Boiler (about 5 ft. by 12 ft.) wanted. Must be in good condition and satisfy Boiler Insurance Inspector.
Write, sending dimensions, &c., to No. 4473, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

LAMPS FOR SALE.
THE Columns, Lanterns, Cages, &c., replaced by Electric Lighting Plant.
Malton Gas Company, Malton, Yorks.

FOR SALE, in good working condition, TWO Second-Hand GAS PURIFIERS, 8 feet by 6 feet, and 5 feet by 2 ft. 6 in.
Particulars from Sheldon, Engineer, Wells.

PIPES—About 50 Tons, in perfect order, including Specials. Price £3 per Ton; Specials £4 10s., if sold promptly.
Firth Blakeley and Co., Thornhill, Dewsbury.

FOR SALE, Cast-Iron Scrubber, 28 feet high by 3 ft. 6 in. diameter, filled with boards, together with 3 ft. 6 in. Valves and Connections. Can be inspected at the Gas-Works, Formby.
Prices to J. H. Buckley, Engineer and Manager.

TO BE SOLD, Gasholder, 30,000 cubic feet capacity; another 15,000 feet capacity. Both new and ready for delivery.
The Wright Gas Plant Company, Limited, 181, Queen Victoria Street, London, and Shipley Gate.

FOR SALE—A Small Gas Plant Com-plete, including Gasholder of about 8000 cubic feet capacity, in good condition. Can be seen at any time by appointment with Mr. J. T. Glover, Estates Office, Canwell, Tamworth. Moderate price to immediate Purchaser.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before rdering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

SECOND-Hand Gas Plant for Sale.
2 Lengths of Steel Hydraulic Main, 18-in. by 18-in.
18 Stand Pipes, 5-in. to 4-in.
18 Bridge Pipes, 4-inches.
18 Dip-Pipes, 4-inches.
18 Mouthpieces, 18-in. by 13-in.
1 Wall Condenser, 9-inch Pipes.
1 Young's Washer, 6 feet diameter.
3 Purifiers 8 feet square, Dry Centre Valve, 8-inch Connections.
1 Milne's Round Station Meter, 5000 cubic feet per hour, with 6-inch Bye-Pass.
1 Milne's Governor, 6-inch.
Apply to the Manager, Gas-Works, Peebles. N.B.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.
THE Directors of the above Company invite TENDERS for the supply of 1000 Yards of 3-inch Cast-Iron MAINS (uncoated) delivered at Alderley Edge Station.
Sealed Tenders, endorsed "Mains," to be sent to W. H. Welsh, Esq., 52, Brown Street, Manchester, not later than the 12th of October, 1905.
Any further Information may be had from
Wm. Severs,
Engineer and Manager.
Gas-Works, Wilmslow, Manchester.

THE Knutsford Light and Water Com-pany invite TENDERS for their surplus production of GAS TAR and AMMONIACAL LIQUOR, the latter of various degrees of strength.
Tenders to be sent in on or before Monday, the 9th inst., addressed to the Chairman.
The Directors do not bind themselves to accept the lowest or any Tender.

BLACKPOOL CORPORATION.
THE Gas Committee are prepared to receive TENDERS for the surplus TAR produced during the next Twelve Months from Sept. 30.
Tenders to be endorsed and sent to the Chairman by the 11th day of October next.
By order,
John Chew,
Gas Engineer.
Gas Office, Blackpool,
Sept. 26, 1905.

TENDERS FOR GAS COKE.
TENDERS are invited for the supply of about 4000 Tons of best GAS COKE, to be taken between October, 1905, and December 31, 1906. Prices f.o.b. or f.o.r. to be sent to the undersigned on or before Oct. 18, 1905.
Advertisers can arrange cheap freights from any large centre.
Particulars as to delivery on application to the West of England China, Stone, and Clay Company, St. Austell, to whom Tenders for the whole quantity or a smaller quantity may be sent.

THE Corporation of Middleton invite TENDERS for the supply of 5000 INCANDESCENT GAS-MANTLES for Street-Lamps.
Further Particulars and Form of Tender (which contains a Fair-Wages Clause) may be obtained from Mr. Job Kempton, Lighting Superintendent.
Tenders, accompanied by samples, are to be addressed to the Chairman of the Watch Committee, endorsed "Tenders for Mantles," and delivered at the Town Hall on or before Saturday, the 14th of October, 1905.
The Corporation do not bind themselves to accept the lowest or any Tender.
Frederick Entwistle,
Town Clerk.
Town Hall, Middleton,
Sept. 25, 1905.

BOROUGH OF NELSON.
FIRE-CLAY GOODS.
THE Gas Committee invite Tenders for the supply of FIRE-CLAY GOODS for Season 1906.
Specification and Form of Tender may be obtained on application to Mr. A. J. Hope, Engineer, Gas-Works, Nelson.
Tenders, endorsed "Fire-Clay Goods," and addressed to the undersigned, must be received not later than Thursday, the 12th of October, 1905.
The Committee do not bind themselves to accept the lowest or any Tender.
J. H. Baldwick,
Town Clerk.
Town Hall, Nelson,
Sept. 29, 1905.

COKE.
THE Directors of the Sheppy Gas Company invite TENDERS for the purchase of their surplus COKE, for One Year from the 1st of October next to the 30th of September, 1906. Estimated quantity, about 5000 Chaldrons, more or less. Such Coke can be loaded into carts on Works, put on Rail, or into Barge alongside the Company's Wharf in the Medway.
Tenders to be sent in by Thursday, the 12th of October.
The Directors do not bind themselves to accept the highest or any Tender.
By order,
H. Barber,
Secretary and Manager.
Offices: 2, Trinity Road,
Sheerness, Sept. 25, 1905.

BRIDGEWATER COLLIERIES COKE-WORKS.
(The Earl of Ellesmere.)
TENDERS are invited for the Light OIL produced at the above Works for a period of Six or Twelve Months from the 1st of November, 1905, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding on the Little Hulton mineral branch of the London and North-Western Railway.
Tenders, endorsed "Tender for Light Oil," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 23rd of October, 1905.
Manchester, Sept. 26, 1905.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.
NOTICE is Hereby Given, that the Directors have this day declared an INTERIM DIVIDEND at the rate of 6 per cent. per Annum for the Six Months ending June 30, 1905 (being six shillings per Share), free of Income-Tax, payable on and after the 20th prox.; and Notice is Hereby Further Given, to Holders of Share Warrants to Bearer of this Company, that Coupon No. 31 will be paid by the Company's Bankers, The Union of London and Smith's Bank, Limited, 50, Cornhill, E.C., on and after the 20th prox., at the rate of six shillings per coupon.
Coupons must be left with the Bankers three clear days for examination.
The TRANSFER BOOKS WILL BE CLOSED from the 2nd to the 14th of October, both days inclusive.
By order,
W. F. Wayte,
Acting Secretary.
1, East India Avenue,
Leadenhall Street, E.C.,
Sept. 28, 1905.

"Invaluable to those engaged in lighting works."—ENGINEERING. NOW READY, Price 10/6 net. REVISED TO JULY, 1905.

TWENTY-EIGHTH ANNUAL ISSUE.

GAS-WORKS DIRECTORY AND STATISTICS 1905-6

WITH ALPHABETICAL LIST OF CHAIRMEN, MANAGERS, ENGINEERS, AND SECRETARIES.

SEND FOR PROSPECTUS AND SPECIMEN PAGES,

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ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including in Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
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MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, October 17, at Two o'clock, in Lots.

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Above the Average in Weight and Quality of Coke.

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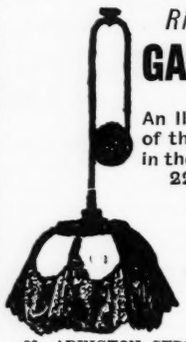

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Efficiency
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The only Inverted Burner made on true Scientific Principles.

Artistic in Appearance.
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Supersedes Electric Light at one-tenth the cost.
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Thousands have been recommended and fixed by the leading Gas Companies.
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Gas Consumption only 2½ c.f. per hour.
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No Lighting Back.
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EASILY FIXED TO ALL EXISTING FITTINGS.
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MANUFACTURERS OF
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ESTABLISHED 1860.

STEEL SCOOPS
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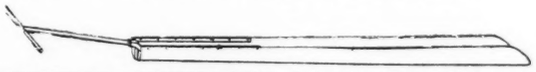
Scoops supplied with or without handles, and of any dimensions or shape required.



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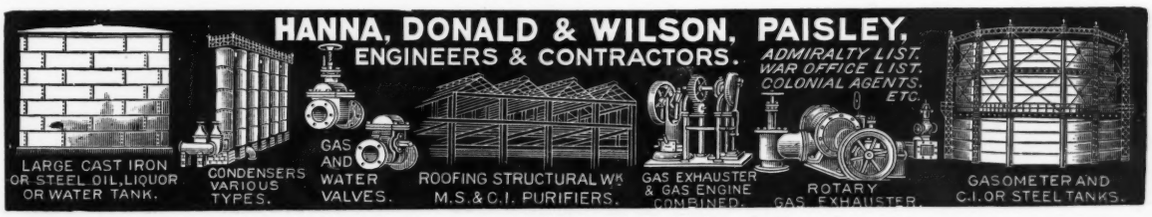
Wet and Dry Gas Meter Manufacturer.
PREPAYMENT METERS for Pennies, Shillings, or any other Coin.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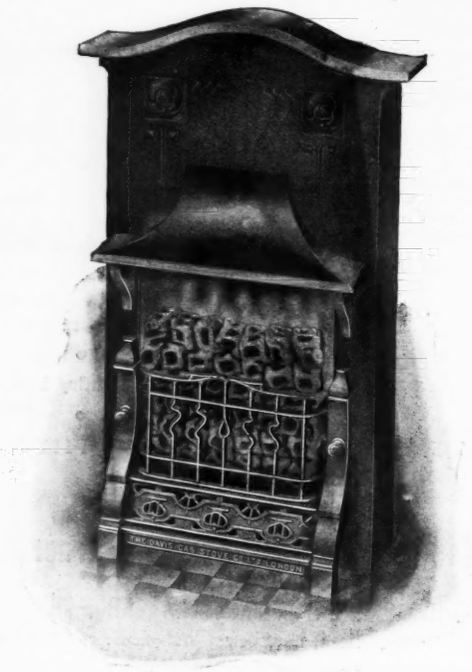
The Davis Gas Stove Co. Limited. LONDON · LUTON & FALKIRK



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The NEWEST THINGS

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These Fires are fitted with our latest Patent Burner, constructed on an entirely new principle after much careful experiment.

The Stoves are simple in construction, all parts—Bricks, Burners, &c.—being easily removed.

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A very handsome and up-to-date Fire.

	Height.	Width.	Fire.	Height from floor to top of flue.
Sizes—	28	17	10	19 inches.

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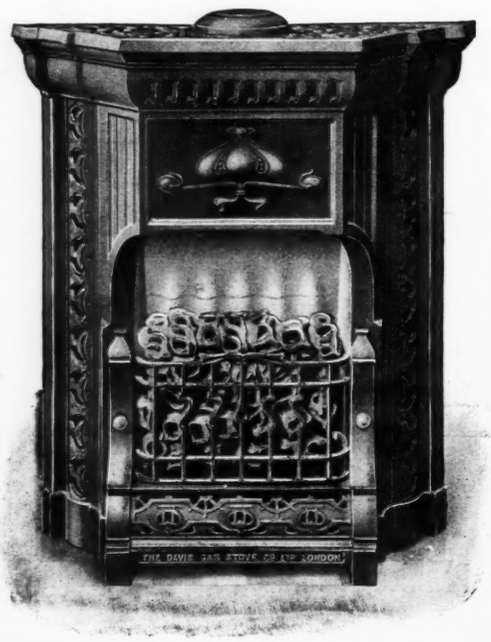
Best Berlin-black Enamel	**37/6**
Electro-Bronzed	**62/6**

Nickel-plated trivet 2/- extra.



No. 45.

No. 45.

A very artistic Nursery Fire, with separate Boiling Burner on top.

	Height.	Width.	Fire.	Height from floor to top of flue.
Sizes—	25	22½	10	17¼ inches.

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Dull Black Enamel	**27/6**
Best Berlin-black Enamel	**35/-**

With Solid Brass Ornaments in Canopy, 2/6 Extra.
Nickel-plated trivet . . . . . 2/- „
Without Separate Boiling Burner . 3/6 LESS.

Send for complete Catalogue of the "DIAMOND" Series. These Fires will attract new Consumers—and keep them.

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RADIANT,

AND

RELIABLE.

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Absolutely No Shadow.
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SERVICEABLE.

MODERN CATALOGUE FREE.

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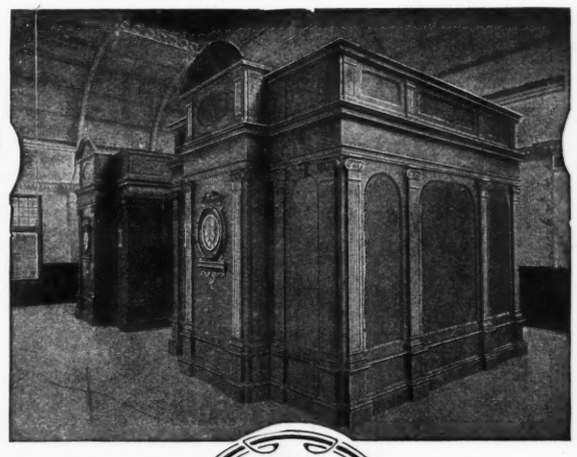
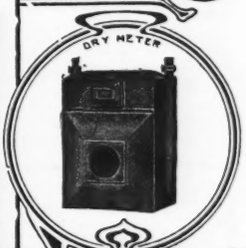
LIMITED

GAS & WATER ENGINEERS,





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6 LITTLE BUSH LANE, LONDON, E.C.

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SLOT METERS.
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OF THE
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(Deutsche Continental Gas Gesellschaft).
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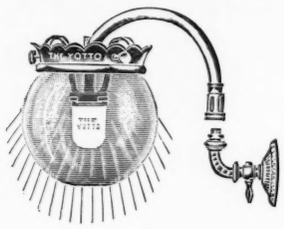
HEAVILY IMPREGNATED.

"YOTTO" NEW INVERTED BURNER.

No Adapter or Special Fitting Required.



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Great Reductions for Quantities.
SEND FOR NEW LIST FREE.
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TUBES
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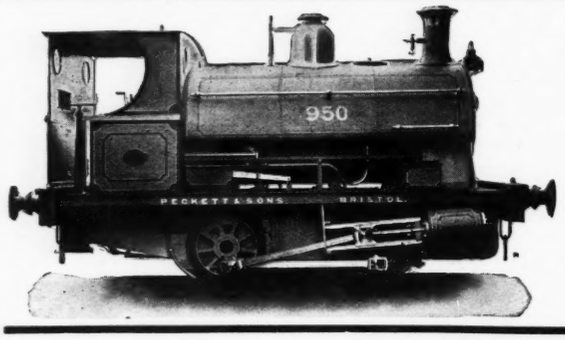

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FIG. I. 441.

NEW SOLID COPPER CASE LAMP
With Patent Bye-Pass Lever Cock
FOR INVERTED
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GAS BURNERS.
Manufactured by
GUEST & CHRIMES,
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A FEW EXAMPLES OF

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LATEST REGISTERED INCANDESCENT FITTINGS.

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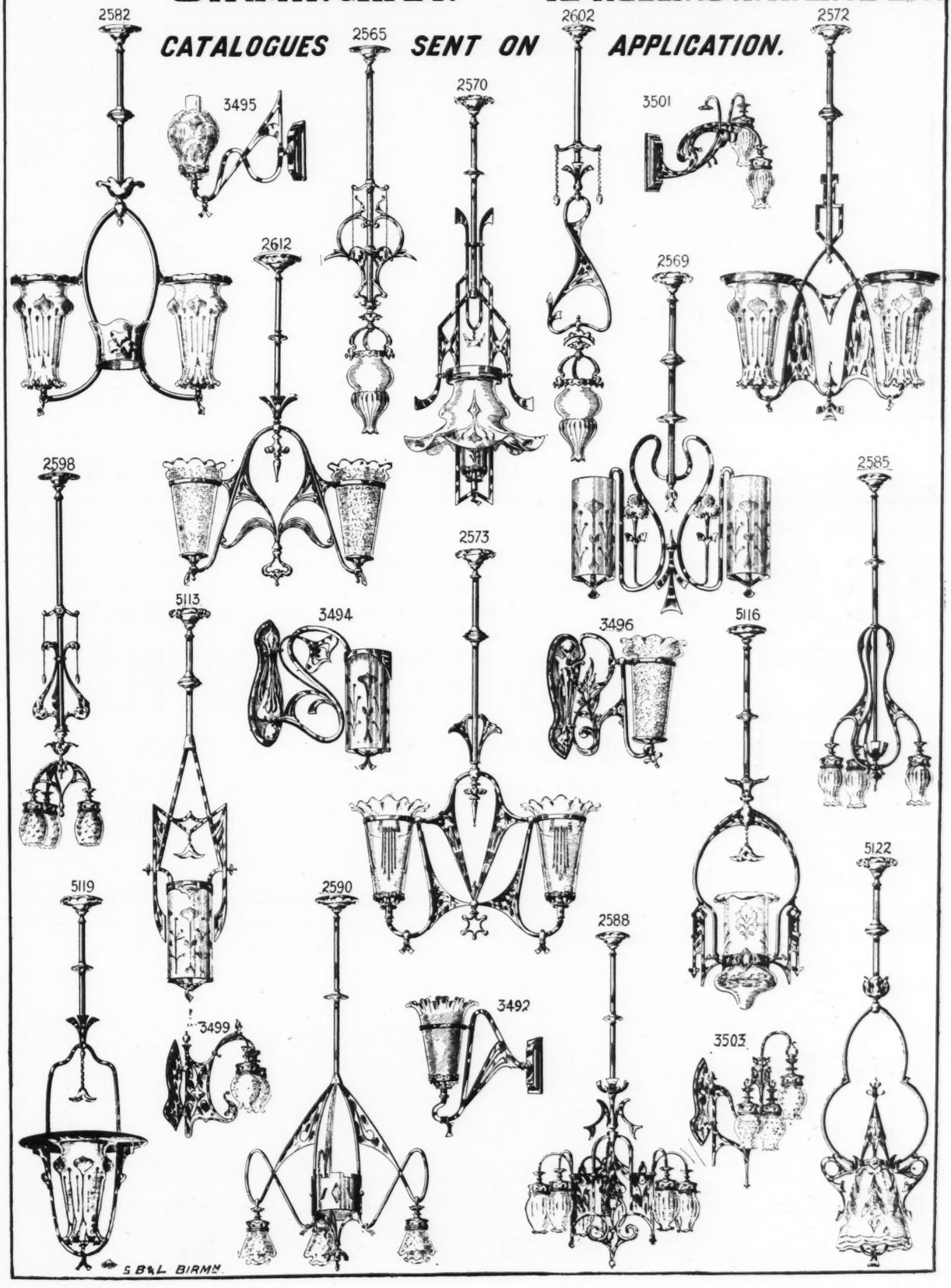

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The sensible lamp par excellence is without a doubt the Lucas. It attains its end by the scantiest means—it is the embodiment of simplicity and therefore the greatest lamp in existence. It has marked the boundary line of efficiency—it has no more real rival to-day than it had 3 years ago or will have 3 years hence. Highest power—no waste—easy installation and use: Such is the motto of the Lucas Lamp. It is the light that is worthy of your support.

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PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP-PILLARS, RETORT-FITTINGS, ETC.

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STRUCTURAL IRON AND STEEL WORK

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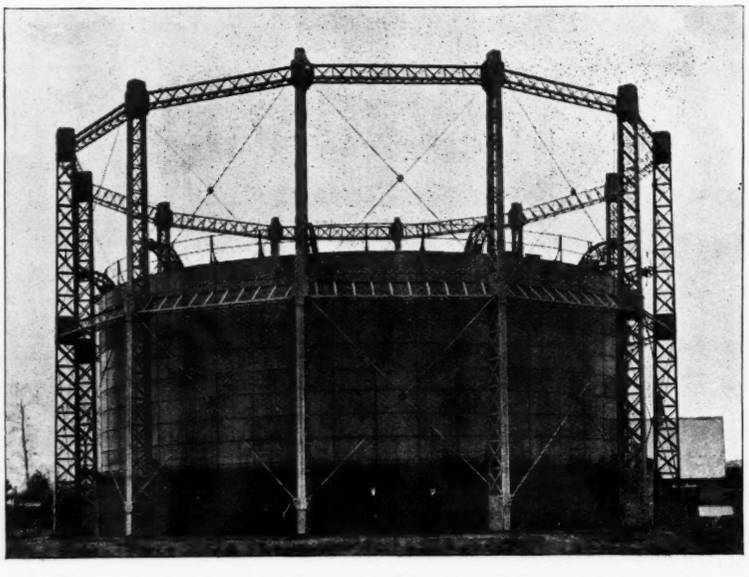

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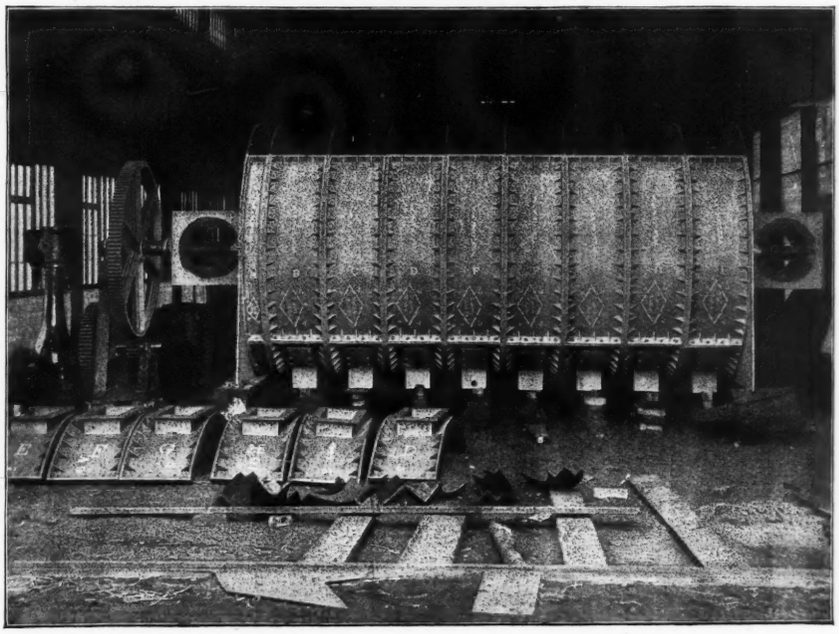
THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

LARGE AREA OF WASHING SURFACE.

REMOVAL OF THE WHOLE OF THE AMMONIA AND A LARGE PERCENTAGE OF CO_2 AND SH_2.



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BUNDLES EASILY ACCESSIBLE FOR CLEANING.

"Whessoe" Rotary Washer-Scrubber (H. Kirkham & Chandler's patent). **Capacity 1,500,000 Cub. ft. per diem.**
One of Two Machines supplied by us to a Foreign Gas-Works, photographed in our shops during course of construction.

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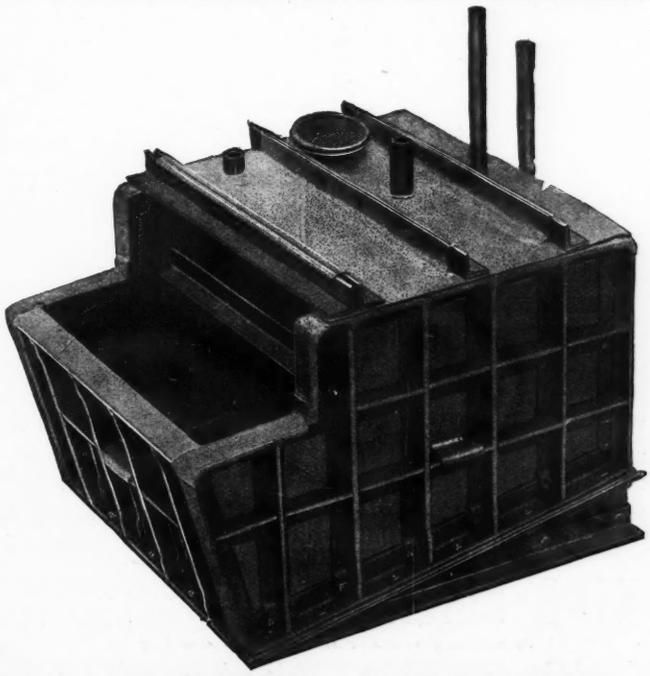
ELECTRICALLY WELDED!

Prices on application.



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Gas and General Engineers.

CONTRACTORS FOR
COMPLETE RETORT-HOUSE PLANT
EITHER ON
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Photograph showing West's Coke-Conveyor dealing with the Coke from Nineteen Through Beds of Retorts.

WEST'S IMPROVED PATENT HOT-COKE CONVEYOR

With Special Chain constructed with a minimum number of parts, and having Large Joint Pins with ample Bearing Surfaces.

WEST'S STOKING MACHINERY—COMPRESSED AIR DRIVEN AND MANUAL SYSTEMS.

COAL BREAKING, ELEVATING, & STORING PLANTS.

BELTON'S PATENT AUTOMATIC RELIEF APPARATUS FOR HYDRAULIC MAINS.

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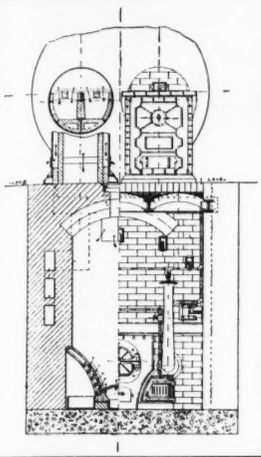

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20 % Saving in Fuel.
20 % more Water Evaporated per hour.
Steady Steam Pressure.
Fuel Employed—Coal or Coke.

Perfect Combustion—17 to 18 % CO_2 in Waste Gases.
Producer Cleaned once in 24 to 48 hours.
Applicable to all Boilers.

INEXPENSIVE. DURABLE. SIMPLE.

DESIGNS AND ESTIMATES FROM

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THE "ETNA" INVERTED

INCANDESCENT GAS BURNER.

PATENTED — 1904. — NO. 15,883.

Small Gas Consumption.

Does not light back.

Brilliant Light.

No Blackened Surfaces.

Regenerative Principle.

ILLUSTRATED LIST ON APPLICATION.

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THE SILICA FIRE-BRICK COMPANY.

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RADIATE MORE HEAT

BY USING

SILCO BRICK RETORTS.

SILCO BRICKS prevent all settling of setting.

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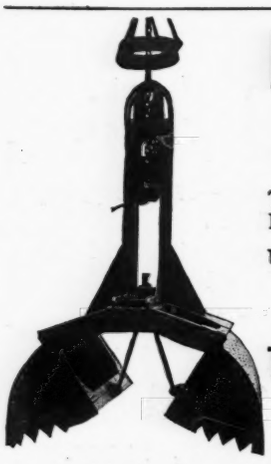

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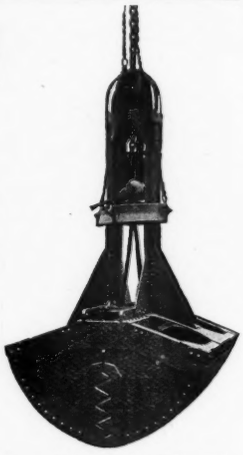

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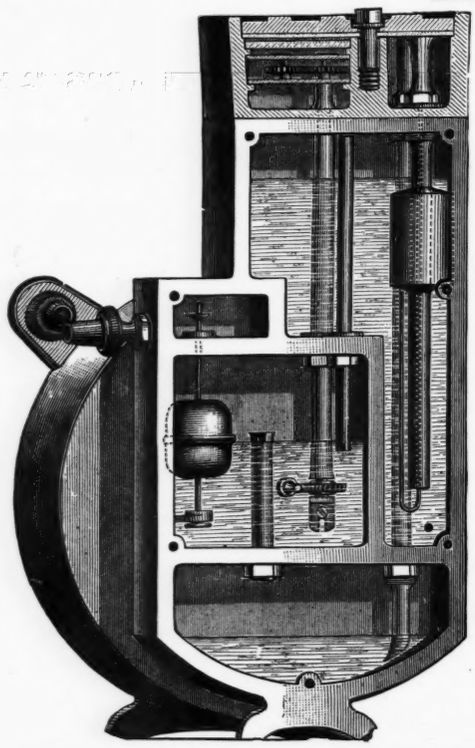

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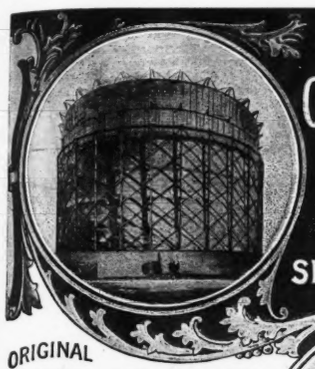

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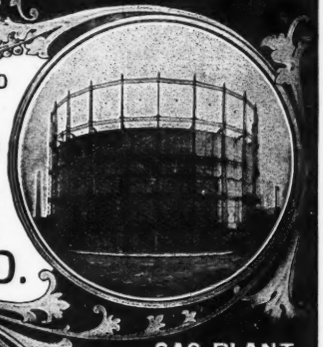

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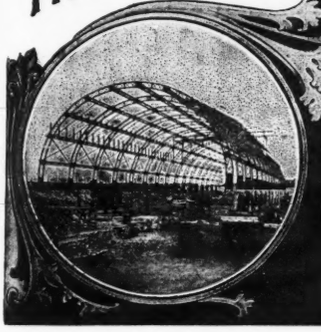

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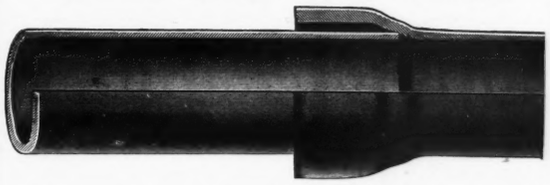

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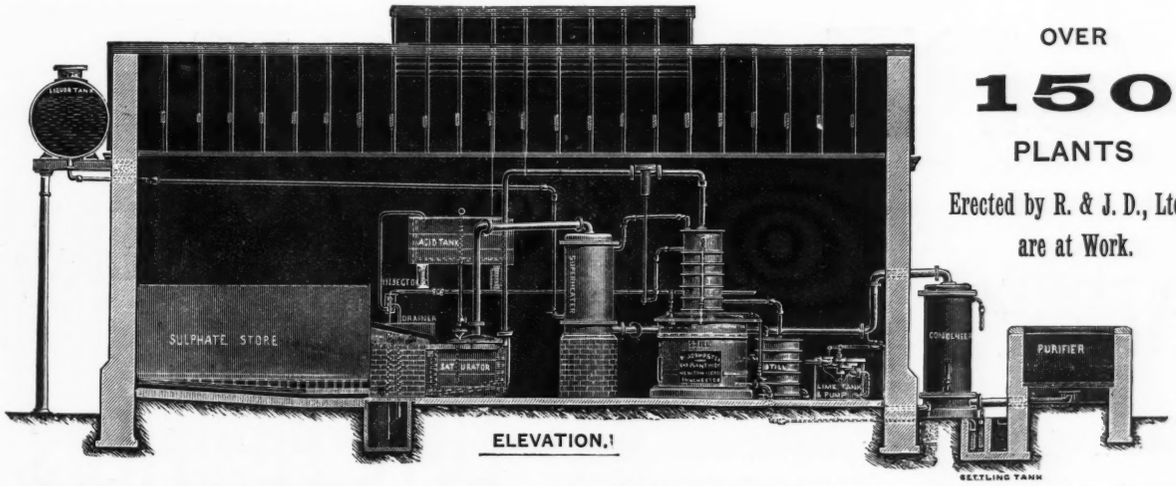

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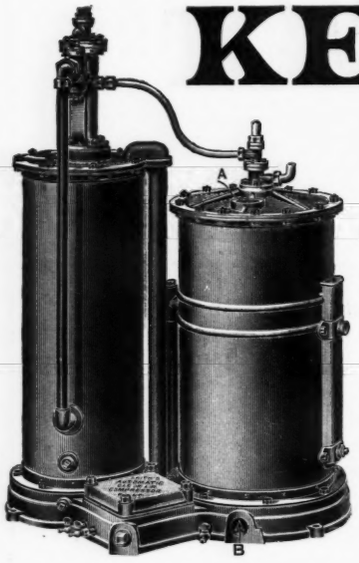

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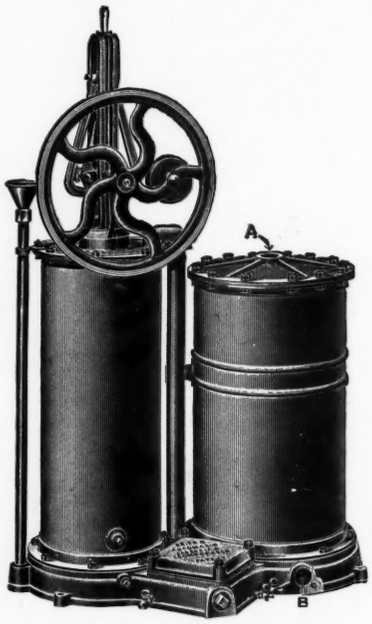

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